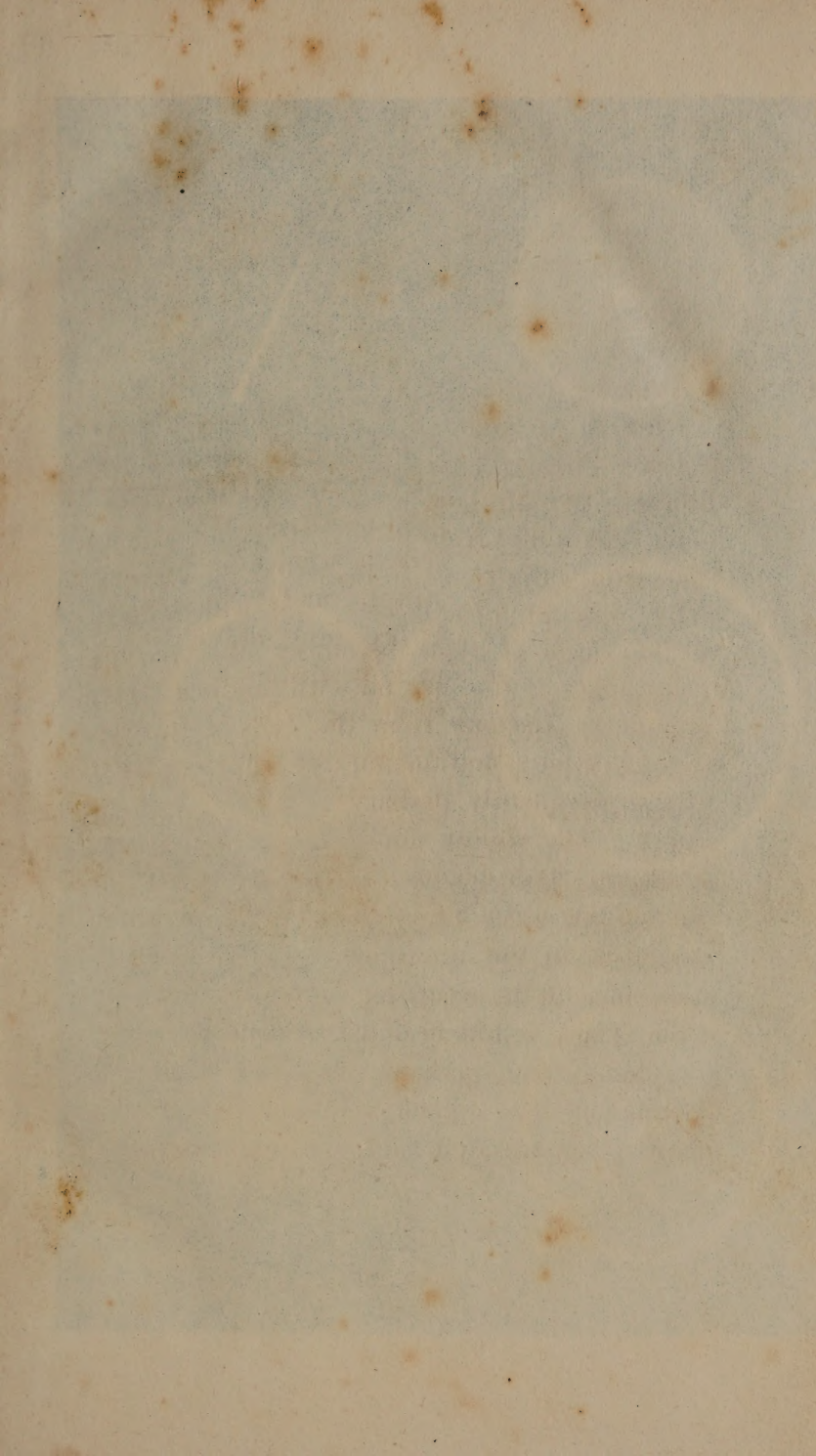
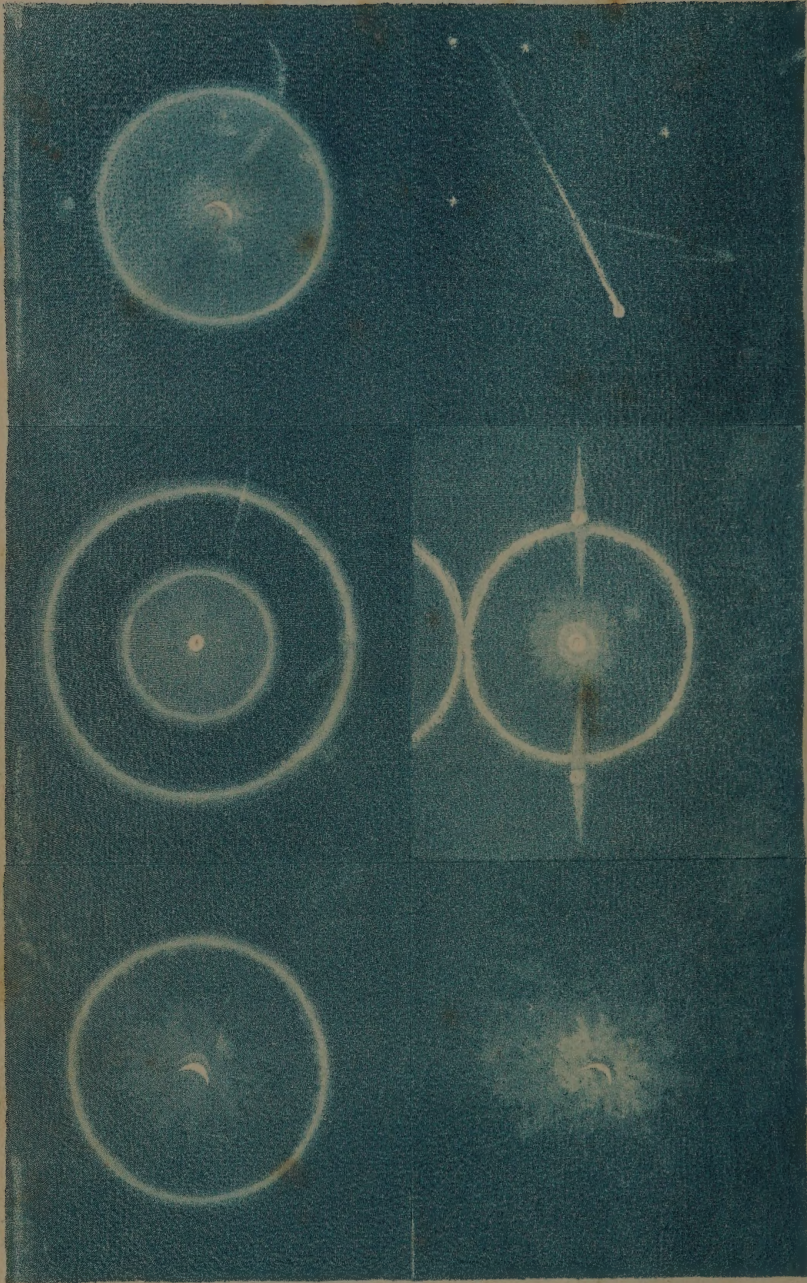


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RESEARCHES

ABOUT

ATMOSPHERIC PHAENOMENA.

BY

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PHILADELPHIA; MEMBER OF THE ASTRONOMICAL
SOCIETY OF LONDON; OF THE MEDICAL
AND CHIRURGICAL SOCIETY;
&c. &c. &c.

THIRD EDITION,
CORRECTED AND ENLARGED;
With a Series of Engravings illustrative of the Modifications
of the Clouds, &c.
TO WHICH IS ADDED THE
CALENDAR OF NATURE.

ΕΣΤΙΝ. ΑΝΘΡΩΠΟΙΣ. ΑΝΕΜΩΝ. ΟΤΕ. ΠΛΕΙΣΤΑ.
ΧΡΗΣΙΣ. ΕΣΤΙΝ. Δ' ΟΥΡΑΝΙΩΝ. ΤΑΤΩΝ.
ΟΜΒΡΙΩΝ. ΠΑΙΔΩΝ. ΝΕΦΕΛΑΣ.

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PREFACE

TO

THE SECOND EDITION.

AMONG the many erroneous views which people take of the origin of the sciences, no one appears more common than that of supposing that they have all been originally undertaken and pursued with some particular aim to public or individual utility; as if the investigation of nature was not valuable; nor natural phaenomena capable of exciting us to the pursuit of their causes, on account of the pleasure they produced in engaging the energies of our different intellectual faculties, independently of any further purpose to which they might be made subservient. Some imagined object of utility, for the attainment of which people consider the different sciences as valuable, has generally been supposed to be the cause which has impelled mankind to follow them, as if from feeling certain exigencies arising from time to time out of the progressive civilization of so-

ciety, men had been taught to love the pursuit of knowledge and the exercise of reflection, by the imperious calls of newly created wants. This is a very old opinion. People, too, having confounded the causes of excitement existing around us in the world with the various faculties of the mind to be excited, have even supposed that our propensities, sentiments, and our intellectual and reflecting powers have been derived from education; and that from the contingent circumstances of different individuals have arisen the varieties of the human character; without reflecting on the infinite variety of organization observable in individuals throughout the creation, and without ever perceiving that unless there were conditions in ourselves of the different manifestations of the mind, the objects around us could never excite, nor education ever improve our several faculties. I have always believed that there were differences in the native structure of persons which independently of, though perhaps modified by, early habits and associations, have inclined them naturally to the pursuit of different branches of science. And, I think, the recent investigations of modern physiologists will verify this opinion, and will demonstrate the material con-

ditions necessary to the multiform manifestations of the mind.

People having the idea that every thing is valuable for some secondary object; this object to which an imaginary value is attached varies in the minds of different persons, according to their own particular conformation of mind and to their education. In many, the aggrandizement of property being the prevailing passion, scarcely any thing is considered useful, except that which contributes to public or private wealth. In others, the degree in which any science or art can contribute to common convenience, or abridge labour, becomes the measure of their estimation of it. Judging of others by themselves, people have supposed that the sciences have always been cultivated for such secondary reasons, and that in the early stages of society, they arose out of the numerous artificial wants which advancing civilization was continually producing. But though it has generally been the case with the multitude who have followed up the discoveries of the ingenious, that availing themselves of the intellect of their superiors, they have erected a trade on their inventions, or have converted them to purposes of social improvement; yet many of

those philosophers, to whom society has been indebted for the most important improvements in the sciences, have cultivated them originally for the sole pleasure which the pursuit itself afforded. There have been in all ages, persons who have taken delight in observing and comparing natural facts, and for whose philosophic minds the infinite variety exhibited by all natural objects, and the investigation of the respective causes of different phaenomena, are of themselves sufficient to engage them in the pursuit of science, and the knowledge obtained thereby an adequate reward for their labours.

In the earliest ages, as far back as history enables us to trace the operation of the human intellect, we find mankind interested about meteorological phaenomena. A circumstance by no means astonishing, when we consider the vast importance of this science to the shepherd and agriculturist, and the interest the study of it engaged, as a means of enabling men by anticipating the event of terrible atmospheric commotions, to provide in some measure against their effects. The beauty, also, of many atmospheric phaenomena, and the interesting variety of scenery which they produce for the spectator; together with the natural curiosity excited

about their causes, which man is organized to feel, have contributed probably in a great measure to interest people in this science.

Meteorology considered as a subject of amusement seems to have some advantages over many other pursuits; inasmuch as it may be studied and will afford interest in places unfavourable to the cultivation of other sciences. The botanist, who delights in the diversification of nature exhibited in the endless variety of the forms and colours of flowers; or the naturalist, who finds amusement in contemplating the habits of animals, and the adaptation of the structure of each to its mode of life, cannot indulge their inclination except in habitable countries, or where vegetation and life abound. But on the barren mountain's rugged vortex, in the uniform gloom of the desert, or on the trackless surface of the ocean, we may view the interesting electrical operations which are going on above, manifested in the formation and changes of the clouds, which bear water in huge masses from place to place, or throw it down in torrents on the earth and waters; occasionally creating whirlwinds and water spouts; or producing the brilliant phaenomena of meteors and of lightning; and constantly ornamenting the sky with

the picturesque imagery of coloured clouds and golden haze. The atmosphere and its phenomena are every where, and thunder rolls, and rainbows glitter in all conceivable situations, and we may view them whether it may be our lot to dwell in the frozen countries of polar ice, in the mild climates of the temperate zone, or in the parched regions which lay more immediately under the path of the sun.

Among the ancient nations of oriental shepherds, the cultivation of this science must have been particularly useful; chemistry and many other sciences which are necessary to the promotion of a more cultivated condition of society, for the improvement of the arts, and manufactures of civil life, were of less utility among tribes, whose chief employment consisted in watching their flocks, and procuring the fruit and other vegetable productions on which they subsisted.

Constantly abroad in a serene atmosphere, and endowed with strong faculties for observation and analogy, the eastern tribes of old, in Egypt and Syria, observed accurately the phenomena of the heavens, and collected, compared, and recorded, facts that laid the foundation of astronomy and meteorology, which the Grecian

and Roman philosophers continued to cultivate, and which have been brought nearer to perfection in later times.

Meteorology, regarded as a science distinct from astronomy and astrology, appears to have been first systematically treated of by Aristotle, who seems by his works to have been constantly employed in observing and comparing natural objects. He described with accuracy many atmospheric phaenomena, and employed himself in investigating their causes. He assigned the cause of the rainbow, and of the halo, and appears to have given a more minute detail of the various appearances of clouds, rain, hail, snow, dew, meteors, and other phaenomena which occur in our air than any preceding or cotemporary writer. Shortly after him Theophrastus, who had been his pupil, collected all the popular prognosticks of the weather, under four heads; 1, *Περὶ σημάτων υετών*; 2, *Περὶ σημάτων ἀνέμων*; 3, *Περὶ σημάτων χειμῶνων*, and 4, *Περὶ σημάτων ἐυδίων*: these prognosticks Aratus soon embodied in his *Diosemea*, which was a sort of appendix to his astronomical poem the *Phaenomena*, which was translated into Latin verse by Cicero, by Germanicus, and by Festus Avienus. We find meteorological observations interspersed in the writings of the

Greek historians; and the frequent allusion to atmospheric phaenomena by their poets shows the attention which was generally paid to such subjects. The simplicity and correctness of narration adopted by the Greeks was probably the result of the prevailing perfection of their physical organization which is one of the principal conditions of intellectual excellence, and in which their philosophers excelled most of those of more modern times. The heads of the ancient Greek philosophers are of a remarkably fine form for intelligence.* The Romans who

* The heads of many of the Roman philosophers, and indeed of those of all countries, ancient and modern, did certainly, as well as those of the Greeks, refute Juvenal's satirical assertion *fronti nulla fides*, if he ever really intended such as a serious observation; but the configuration of the heads of those celebrated ancient nations, who gave birth to the sciences from the native energies of their intellectual faculties, is more particularly calculated to illustrate and confirm the notions of modern physiologists respecting the intimate connexion between the physical strength of the organs of the brain and the intellectual and moral character of the individual. A subject which has been ably treated of by the celebrated anatomists, Gall and Spurzheim, who by their elegant dissections of the brain, and their comparison of the brains of different animals with the proper habits of each, seem to have roused human and comparative anatomy into something like a systematic science.

wrote on meteorology of any note were Pliny, who in his *Natural History*, lib. xviii. cap. 35, wherein he treats of the prognosticks of the weather, confounded his observations with abundance of fabulous and absurd narrations; Virgil, who in his *Georgics* imitated the prognosticks of Aratus; Lucretius, who endeavoured to assign physical causes for most of the popular phaenomena of the heavens; and, lastly, Seneca, with whose superfluous tautology in his *Natural Questions*, every one who has read them must have been heartily tired. In the works too of many of their other writers we find traces of their meteorological knowledge. It is a pity we know so little of the collateral history of this as well as of the sciences among the Chinese and Arabians; and among other eastern tribes of the present day.

Little account of the state of our science can be traced from the time of the ancient Romans to the revival of letters in Europe; and it was not till the middle of the last century that any advancement was made in meteorology. During the middle ages which elapsed between the decay of the Roman Empire and the general revival of literature, meteorology like every science, was confined to the monasteries and re-

ligious institutions of seclusion. Shortly after learning again began to flourish, and the energies of the human mind again exerted themselves on a more general scale, according to the particular genius of individuals, there appeared persons who delighted in aërial phaenomena, and Saussure, De Luc, Bertholon, and others at length roused the attention of mankind to the production of our atmosphere. The attention of philosophers since their writings seem more particularly to have been directed to these subjects, which can only be brought towards perfection by the repeated observations of people in different places. To add what few I have made myself, and to engage the attention of more able and industrious meteorologists to some facts in the science at present little known, is the reason of the present publication.

In conclusion of this rude sketch of the science from its earliest records to the present day, we are naturally led to reflect on the melancholy picture of the revolution of human society, which the history of almost any science or art will always excite. Science seems to have illumined first the banks of the Nile, and to have dawned on the early tribes of Egypt; travelling down from Thebes to Memphis, Cairo, and

to Alexandria, it took a westerly course to Athens, to Rome, and to the many illustrious states which afterwards distinguished modern Europe. But in tracing her progress we find nothing left in her course, but the skeleton of former greatness. The ruins of stupendous cities once the ornament of the East; the numerous fortifications, walls, temples, aqueducts, and other works of art, now nothing but the desolated habitations of wild animals, and the traces left of sciences which, like fruitless flowers, bloomed in the spring of time only to decay, are monuments of human fatality which must impress reflecting persons with gloomy notions of the instability of society, and incline us to fear that, in spite of all the efforts of genius and of art of modern times, the light of knowledge which rose in the East, and civilized the oriental nations, will set on the Western parts of the world, and leave us, ere long, a monument to future ages of the fluctuating nature of human perfection, unless by a strict attention to the improvement of the physical organization of our species, conjoined with the adoption of some general plan of education superior to any hitherto enforced, we should permanently improve the moral and intellectual character of

future generations; without which all the scientific records imaginable would be to them only as cyphers scrawled on the barrenness of intellect.

Two large impressions of this work having been sold, the Author has yielded to the solicitations of his friends in preparing for the press a THIRD, in which he has added a considerable number of new observations, and has appended a Journal of Natural History, in order that the reader, by comparing the Calendar of Flora, &c. with the weather, may arrive to a more perfect notion of the particular climate of this part of Britain.

CONTENTS.

CHAPTER I.

	Page
Of M. Howard's Theory of the Origin and Modifications of Clouds.....	1

CHAPTER II.

Further Observations about the Peculiarities of the Clouds	40
--	----

CHAPTER III.

Of certain Accensions which appear to take place spontaneously in the Atmosphere, called Falling Stars, Meteors, &c.....	114
--	-----

CHAPTER IV.

Of the Indications of the future Changes of the Weather	128
---	-----

CHAPTER V.

Of the Influence of Peculiarities of Weather on the Functions of organized Bodies.....	176
--	-----

CHAPTER VI.

Some Particulars concerning Winds.....	200
--	-----

CHAPTER VII.

Of Electricity.....	205
---------------------	-----

CHAPTER VIII.

	Page
Further Investigation of the Peculiarities of Weather....	231

CHAPTER IX.

Some Miscellaneous Observations on Atmospheric Temperature and Pressure.....	243
--	-----

CHAPTER X.

Of several superstitious Notions which appear to have had their Origin in an Observance of certain Meteorological Phaenomena.....	251
Appendix, containing Observations on Diet as connected with the Influence of Atmospheric Diseases—Quotations from Authors on Meteorology, &c.....	331
Calendar of Nature.....	354
Explanation of Plates.....	444

Of the Publishers of this Work may be had, by the same Author,

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RESEARCHES.

CHAPTER I.

OF M. HOWARD'S THEORY OF THE ORIGIN AND MODIFICATIONS OF CLOUDS.

A CLOUD is a visible aggregate of minute particles of water suspended in the atmosphere. In the more extensive signification of the word, smoke and all the visible effluvia of volatile substances may be considered as clouds; meteorologists have, however, confined this term to aqueous particles.*

* Our English word *Cloud* is derived of the Anglo-Saxon verb *hlidan* or *Lehlian*, *tegere*, to cover; from the same verb came *glade*, *blot*, *lot*, and *lid*. In like manner, the Latin *nubes*, and its diminutive *nebula*, came from the Latin verb *nubere*; and from the same verb is derived *nupta*. So the Greek *νεφος* and *νεφελη* from *νεφειν*. It need hardly be observed here, that all that words can do, is to express some of

Before I speak of the origin, suspension, and varieties of clouds, and of their destruction by rain, some preliminary observations will be necessary. Aqueous particles, and other volatile substances, may be either diffused in the air, or may be dissolved in it. But diffusion and solution are things quite different from chemical combination.

A cloud may either be so diffused as to cease to be visible as an aggregate, or it may be taken into solution by the air: in the former case, a hazy turbidness; in the latter, an additional clearness of the sky; would probably be the consequence.*

the qualities of the thing they represent; they serve merely as hints for the production of ideas.—See TOOKE'S *Επεὶ Πτεροεντα*, 4to. vol. ii. 196.

* A cloud may be the consequence of vapour, upraised into the air, and afterward more condensed into visible particles, by an alteration either in the temperature or pressure, whereby the air cannot hold so much vapour in solution as before. Some recent discoveries have, however, led to a supposition that, under particular circumstances, the air itself may be decomposed so as to deposit water, which may again be taken up by the air. Thus we come back again to the old opinion of Aristotle:—*Εἰ δὲ γίνεται ὕδωρ ἐξ αἰρος, καὶ ἀπὸ ἐξ ὕδατος, διὰ τινὰ ποτ' αἰτίαν οὐ συνίσταται νεφὴ κατὰ τὸν ἄνω τόπον*, &c.—*Meteor.* lib. i. cap. 3.

I speak first of clouds, because in the observance of the varying countenance of the sky, as M. Howard terms it, and of its connexion with atmospheric changes, consisted the popular meteorology of the ancient agriculturists, who were chiefly concerned to inquire

*Quo signo caderent Austri, quid sæpe videntes
Agricolae propius stabulis armenta tenerent.*

And the accuracy of their observations, with respect to prognostics of the change of weather, have been verified by those of more modern meteorologists. It is obvious, however, that the ancients wanted definite terms whereby to express the peculiarities observable in clouds and other atmospheric phaenomena; a deficiency which has been in some degree supplied by the moderns, and particularly by M. Howard, whose theory of the formation and destruction of clouds appears, as far as I am capable of judging, to be extremely accurate in most particulars. As it will be necessary for me to have perpetual reference to this theory, and as I shall always use the terms which he has adopted, it will be proper to present the reader with the substance of it, as nearly as I can recollect it, with such additional observations as I have been enabled to make since, together with

references to those passages in the writings of the ancients which appear to bear upon the subject.

I shall not pretend, however, to give exactly M. Howard's observations, but only an abstract of the principal facts, as far as they immediately relate to the origin and appearances of the clouds; for further particulars, I refer the reader to the original paper printed in the *Philosophical Magazine*.

SECTION I.

Of the artificial Distinction of Clouds.

CLOUDS are distinguished by seven modifications, the peculiarities of which seem to be caused by the agency of electricity: for example, three primary modifications, the CIRRUS, the CUMULUS, and the STRATUS; two, which may be considered as intermediate in their nature, the CIRROCUMULUS and CIRROSTRATUS; one, which appears to be a compound, the CUMULOSTRATUS; and, lastly, the CUMULOCIRROSTRATUS, or NIMBUS, a state which immediately precedes and attends the resolution of clouds into water, and is therefore called the RAINCLOUD.

SECTION II.

Of the Cirrus or Curlcloud. Pl. I. Fig. 1.

CIRRVS. Def. NVBES CIRRATA TENVISSIMA QVAE
VNDIQUE CRESCAT.

THE cirrus is a cloud which appears to have the least density, and generally the most elevation, and which has the greatest variety of extent and direction. It may truly be called the Proteus of the skies; for, in some kinds of weather, its figure is so rapidly and so continually changed, that after turning the eye away from it for a few minutes, it will frequently be found so completely altered, as scarcely to be identified as the same cloud. This, however, is not always the case; it is sometimes visible for many hours and even days together, without much changing its appearance. I shall briefly mention some of its most common varieties, together with the circumstances under which they generally appear.

After a continuance of clear weather, the cirrus is frequently the first cloud which is seen. In this case it often looks like a fine whitish thread pencilled, as M. Howard expresses it,

on the clear blue sky: to this other, faint lines of the same kind are added laterally; they increase in size and length, and often serve as stems from which numerous branches proceed, and become other cirri of the same kind. These linear cirri will generally be found to be very high in the air, the lines frequently extend quite across the welkin, while their ends, being lost in either horizon, appear, from a well known optical deception, to converge into one point. They do not always extend in parallel lines; they frequently diverge, or increase obliquely downwards. Sometimes transverse lines are formed, which intersecting the others at right angles, give to the sky the appearance of being covered with a beautiful network. Of late, by way of distinction, I have used certain specific names for the various forms of each modification. I have called this netlike feature the reticular cirrus. Those which are local and detached, and which ramify in many directions, giving the idea of a distended lock of hair, may be denominated comoid cirri. Sometimes numerous little filaments appear like bundles of thread, which I have called filiform cirri. In fair, dry weather, with light gales, obliquely descending bands of fibrous texture are often seen, and fre-

quently move slowly along from the leeward in a supervening current. I by no means intend, by the above account, to infer that the appearances of the different kinds of cirri, or indeed of any cloud, are ever quite uniform; on the contrary, scarcely two occur exactly alike; and there are many features so various and so mixed, that a particular description of each can scarcely be attempted. In some kinds of weather, the numberless and everchanging figures which this cloud is continually presenting to the eye, baffle all attempt at description. Practical observation affords the only means of becoming acquainted with them.

The observations of M. Howard, as well as those which I have made since the perusal of his meteorological papers, have induced me to believe, that, under whatever form the curlcloud may appear, it must always be regarded as a conductor of the electric fluid. Its very texture seems indicative of its particular office. The long parallel and elevated lines are probably equalizing the electricity of masses of air very remote from each other. The detached comoid cirri equalizing their own electricity with that of the surrounding air, while oblique or depending tufts appear to be conducting from an upper to

a lower stratum. The cirrus, too, is sometimes interposed and conducting between two other clouds at some distance from each other. All the phenomena which I have witnessed, since my attention was directed to nepheology, are reconcileable with this supposition: and it is probable that a cirrus ceasing to conduct, ceases to be a cirrus, and that it either evaporates, or passes to some of the other modifications: in doing which, it may often be seen in an intermediate state, partaking more or less of the modification into which it may be changing, and exhibiting, in the progress of its metamorphosis, very various and very beautiful appearances.

I have elsewhere had occasion to notice the long continued appearance, and the multiform and everchanging configurations of this and the other modifications, unattended by rain, and accompanied by dry, variable, and generally easterly winds, the abundance of nocturnal meteors, and the intermitted actions of De Luc's ærial electroscope, as indicative of a very peculiar state of the electric atmosphere; and, I believe, not a very healthy one.

SECTION III.

Of the Cumulus or Stackencloud. Pl. I. Fig. 3.

CVMVLVS. Def. NVBES CVMVLATA DENSE SVRSVM
CRESCENS.

THE cumulus is a convex aggregate of watery particles increasing upwards from a horizontal base. It is commonly of a dense structure, formed in the lower atmosphere, and moving along in the current of wind which is next to the earth. Its first appearance is generally a small irregular spot, which becomes the nucleus on which it forms. This increases in size, preserves a flat horizontal base, and assumes more or less of a conical figure. Cumuli vary in shape and dimensions, according to peculiarities in the operation of the causes which produce them. Sometimes they are pretty well defined hemispherical masses; at others, they rise into mountains, ranged in one plane, their silvery summits presenting a beautiful appearance. In particular kinds of weather, I have seen cumuli of a sort of tuberculated structure. Before rain, they increase very rapidly, descend lower in the

atmosphere, and become fleecy and irregular in their appearance, with their surfaces full of protuberances. In changeable weather, they partake of the vicissitudes of the atmosphere, and evaporate almost as soon as formed, or quickly change into other modifications. The quick formation and subsiding of this cloud may be observed too in fair weather, with easterly and varying breezes, particularly in spring; but, in fair and settled weather, they keep pace in some measure with the diurnal temperature, they form soon after sunrise, arrive at their maximum in the middle of the day, and become very convenient skreens to intercept the rays of the sun; and they subside in the evening. It was this circumstance which probably led to a conjecture of the particular cause of their production, which appears as follows:—The sun's rays warming first the surface of the earth, and their radiation causing warmth to be propagated upward, this warmth converts water on the earth's surface into vapour, which rises and exerts its elastic force on that which the nocturnal decrease of temperature had not decomposed, and which therefore remained diffused. The latter, in passing through the atmosphere, to give place to that from below,

changes its climate, arrives in a colder air, and is thereby decomposed and thrown into a state of visible cloud. The simple attraction of aggeration may perhaps cause the watery particles to collect in a mass,* while their being similiarly electrified may render them mutually repulsive, and prevent their uniting to become rain. The cumulus preserves its plane base, because it floats on the vapour plane, or at that precise elevation at which the air has as much water in solution as from its quantum of heat and pressure from above it is able to contain. Whether the conical form of this cloud is to be attributed to the attraction of aggregation alone, or whether something particular in its electric state may also be concerned, has never, I think, been determined. The variation of its figure, according to different states of weather, seems to favour the latter supposition.

The cumulus, then, may either evaporate, change into the other modifications, or, by inosculating with any of them differently electrified, may form the cumulostratus, and ultimately the nimbus, hereafter to be described.

* This, however, is doubtful, as I mention in the account of the stratus.

SECTION IV.

Of the Stratus or Fallcloud. Pl. II. Fig. 4.*

STRATUS. Def, NUBES STRATA AQVAE MODO EXPANSA,
DEORSVM CRESCENS.

THE stratus is the lowest of clouds; its under surface usually rests on the earth, or on the water. It may properly be called the cloud of night, as it frequently makes its appearance about sunset, and disappears soon after sunrise. When ascending in the atmosphere, it often seems at a certain elevation to take the irregular hemispherical form, and become a cumulus. It comprehends what we usually call fogs and mists, which in fine summer evenings are seen to ascend in spreading sheets from vallies, lakes, and fields. And which in autumn and winter sometimes continue throughout the day as dense

* This cloud is also called Evencloud, and by the Germans Abendwolke, thus in the old popular ballad:

Morgen führt die junge Braut

Heute zum Altare,

Eh die Abendwolke thaut,

Ruht sie auf der Bahre.

fogs. It must be remembered, however, that all fogs are not strati: some appear to be of the modification of cirrostratus. Of the latter kind are generally the wet mists, which moisten every thing on which they alight.

In speaking of the cumulus, I have represented the manner in which elastic vapour may rise into the air, on the accession of diurnal temperature. As the sun sinks, the heat also is diminished, and the lower atmosphere becomes cooler than that above. The air, no longer capable of containing so much vapour in solution as when it was warmer in the day, may deposit it in minute particles of water, which may fall in the form of mist or stratus. In the evening, too, the under atmosphere being as cold, or perhaps colder, than the upper, the vapour plane is not preserved, and cumuli by degrees may sink down in dew. Under these circumstances, they appear often to evaporate.* This vespertine subsidence of the cumulus is a circumstance which induces me to believe that its diurnal existence, as an aggregate, is not merely the result of the attraction of aggeration. Its sub-

* For further observations respecting the nocturnal evaporation of clouds, the decomposition and recombination of the air, etc. I refer the reader to the next Chapter.

sidence at a time when the general dampness of the air would afford a passage for its electricity to the earth, seems to indicate the agency of that fluid in keeping its particles collected into the hemispherical mass in which it usually appears during the day.

There are peculiarities in the appearance of the stratus, of the causes of which we are utterly ignorant. The fine mists which creep, as it were, along the vallies, on a summer's evening, are generally white, and, when seen at a distance by moonlight, have a very fanciful appearance. They are strikingly contrasted to the yellow fogs of November. The stratus is found to be electrified positively, and in general to be highly charged. It is proposed to examine the air above, to see whether there be found a negative counter charge.*

* See *Cyclopaedia*, article *Cloud*; also the *Supplement to Encyc. Brit.* article *Cloud*, where I have given likewise a plate illustrative of the modifications.

SECTION V.

Of the Cirrocumulus or Sondercloud. Pl. III.

Fig. 1.

CIRROCUMULVS. Def. NUBECULAE DENSIORES SUBROTUNDÆ, ET QUASI IN AGMINE ADPOSITÆ.

AFTER the cirrus has ceased to conduct the electric fluid, it probably either disappears by dispersion or evaporation, or it changes into the cirrocumulus or cirrostratus. Its change to the cirrocumulus is frequently marked by the following circumstances: it loses its cirriform and fibrous structure, descends lower in the atmosphere, and assumes the form of a number of well defined and roundish little clouds, lying in close horizontal arrangement: the change is more or less rapid on different occasions, and sometimes takes place in part of the cloud, while the other part remains cirriform, or approaches to the nature of cirrostratus.

When the cirrus ceases to conduct, it probably becomes electrified either plus or minus, and its conversion to cirrocumulus seems to indicate that it has acquired a strong positive

charge. It is difficult, however, to imagine the reason why, under these circumstances, the electrified particles should not collect into a large body like the cumulus, instead of assuming the orbicular arrangement; from which state the cirrocumulus sometimes changes again to cirrus, but more often evaporates by degrees, or passes into the compound modifications. The cirrocumulus is not always uniform in its appearance, it varies in the size and rotundity of its constituent nubeculae, and in their closer or more distant arrangement. It is frequent in summer, and often forms very beautiful skies: at all times of the year it may be seen, in the intervals of showers, and before an increase of temperature, of which its prevalence is a pretty certain prognostic.*

* Extensive beds of cirrocumuli floating gently along in different altitudes must have attracted almost every body's notice: the beautiful appearance of these clouds, with a moonlight evening, has been aptly described by Bloomfield:

“ For yet above these wafted clouds are seen
In a remoter sky still more serene,
Others detached in ranges through the air,
Spotless as snow, and countless as they're fair,
Scatter'd immensely wide, from east to west,
The beauteous semblance of a flock at rest.”

The Farmer's Boy—Winter.

The distinct formation of the cirrus is not always a necessary precursor of the cirrocumulus; the latter frequently forms primarily. This may happen, perhaps, in consequence of a supervening current of air, warmer than the lower, and supersaturated with vapour, which coming in contact with the colder one below, is thrown into a state of aqueous gas, which from peculiarities in the electric state of the air, may assume the cirrocumulative form. The supposition that the cirrocumulus may be caused by an upper current warmer than that below, assists us to account for its being usually followed by increased warmth. For many atmospheric changes take place first aloft, and proceed downwards to the surface of our earth.

SECTION VI.

Of the Cirrostratus or Wanecloud. Pl. II. Fig. 2.

CIRROSTRATUS. NUBES EXTENSATA SUBCOCAVA VEL
VNDVLATA. NUBECULAE HUIUS MODI ADPOSITAE.

I OBSERVED, when treating of the cirrus, that that cloud frequently changed into some other. Its change is generally into either the

cirrocumulus or cirrostratus: when it passes to the latter, it descends lower in the atmosphere, its fibres become denser and in general more regularly horizontal, and it usually appears subsiding, or altering its form. The figure of the cirrostratus, like that of the cirrus, is very various; sometimes it consists in dense longitudinal streaks; at others, it looks like shoals of fish; sometimes the whole sky is so mottled with it as to give the idea of the back of the mackerel; this has been called the mackerelback sky; frequently it appears like the grains of polished wood, or is composed of fine fibres disposed after the manner of the fibres of muscles, which often intersect each other. I have seen the cirrostratus assume the reticular form, like the cirrus, from which it can then only be distinguished by its greater degree of density. This cloud is sometimes spread out into a plane horizontal sheet, more or less dense: this is the form in which the halo generally appears. All clouds are capable of becoming lighter or darker, according to their relative position with respect to the sun: the cirrostratus, however, is remarkable for exhibiting a great variety of beautiful colours, according to its variation in density, to other peculiarities in its structure,

or to its relative position. These appearances are best seen in the morning and evening, when the sun is near to the horizon. They have been well described by the ancient poets,* who have likewise spoken of them as precursors

* VIRGIL, speaking of the prognostics of rain, alludes to several appearances which must be ascribed to the intervention of this cloud.

Sol quoque et exoriens et quum se condit in undas
Signa dabit, solem certissima signa sequuntur
Et quae mane refert et quae surgentibus astris,
Ille ubi nascentem maculis variaverit ortum
Conditus in nubem medioque refugerit orbe
Suspecti tibi sint imbres, namque urguet ab alto
Arboribusque satisque notus pecorique sinister,
Aut ubi sub lucem densa inter nubila sese
Diversi rumpent radii, aut ubi pallida surget
Tithoni croceum linquens Aurora cubile
Heu male tum mitis defendent pampinus uvas
Tam multa in tectis crepitans salit horrida grando.
Hoc etiam emenso quum jam decedat Olympo
Profuerit meminisse magis, nam saepe videmus
Ipsius in vultu varios errare colores
Caeruleus pluviam denunciat, igneus Euros
Sin maculae incipient rutilo inmischerier igni
Omnia tum pariter vento nimbisque videbis
Fervere: non illa quisquam me nocte per altum
Ire neque a terra moneat convellere funem,
At si quum referetque diem conditque relatum

of rain and tempestuous weather; and modern meteorologists have corroborated the speculative notions of the ancients, and have observed the prevalence of the wanecloud to be usually followed by bad weather, as will be further discussed when I come to speak of prognostics of atmospheric changes.

SECTION VII.

Of the Cumulostratus or Twaincloud. Pl. III.

Fig. 1.

CVMVLOSTRATVS. Def. NVBES DENSE IRREGVLARIS
BASIN PLANAM VNDIQUE SVPERCRESCENS.

THE change of the cumulus into the cumulostratus is effected in the following manner: the cumulus, losing its hemispherical figure, increases irregularly upward, grows more dense,

Lucidus orbis erit, frustra terreberè nimbis

Et claro sylvas cernes aquilone moveri.

Virg. Geor. lib. i. 460.

The *radii diversi se erumpentes* are probably the same as the *ραεδοι*, described by Aristotle, in his *Meteorologica*.

and overhangs its base in uneven or rugged folds; a preexisting cirrus, cirrocumulus, or cirrostratus, or one perhaps immediately formed for the occasion, alights on its summit, and inosculates. Many of these cirrostrati are sometimes seen attached to the cumulostratus, and sometimes to intersect it. Cumulostrati frequently remain in this state for a long time, and constitute very picturesque skies. At other times the processes are more rapid. The cirri or cirrostrati are soon lost in the cumulostratus, which increases in density, and soon becomes the nimbus described in the next section. The distinct appearance of the supersident cirri, or cirrostrati, is not necessary to the production of the cumulostratus; on the contrary, the cumulus as often passes to this cloud, and eventually to the nimbus, without the visible precedence of any such conjuncture and inosculation of different modifications. But it is probable that the same kind of processes are going on unseen, and that a similar change always takes place in the electricity of the cumulus, previous to its becoming the cumulostratus. The change being often visibly effected by the anastomosis of two strata of cloud, as above described, and the two strata having been found by experiment to

be differently electrified, we are led to conclude that the process of nimbification, of which cumulostratus is one stage, consists in a neutralization of the electricities of two or more clouds; and that where cumulostratus or nimbus appears, unpreceded by the aforescribed phenomena, the same kind of change has taken place in the aqueous aggregates, from causes which are invisible.*

The cumulostratus varies in appearance; sometimes it overhangs a perpendicular stem, and looks like a great Mushroom; frequently a long range of cumulostrati appear together, which have the appearance of a chain of mountains with silvery tops.† Before thunderstorms, it seems frequently reddish, which some people have imagined to arise from its being highly charged with the electric fluid. Of this, however, more in another place.

* See the experiments of Cavallo with the electrical kite, &c.—*Comp. Treat. Elect.* 2d Ed. p. 370.

† The simple cumulus sometimes has this appearance; and as the change to cumulostratus is gradual, it is often difficult to determine to which modification to ascribe it. A continuity of base to several mountainous superstructures, and an increasing density of colour which by degrees approximates to black, mark the progress of the change to cumulostratus.

SECTION VIII.

Of the Nimbus or Raincloud. Pl. V. Fig. 1.

NIMBUS. Def. NVBES VEL NVBIVM CONGERIES PLVVIAM
EFFVNDENS.

CLOUDS of any one of the aforementioned modifications, at the same degree of elevation, may increase so much as completely to obscure the sky: two or more different modifications may also do the same thing in different elevations, and the effect of this obscuration may be such as would induce an inattentive observer to expect the speedy fall of rain. It appears, however, from attentive observation, that no cloud effuses rain until it has previously undergone a change sufficiently remarkable to constitute it a distinct modification, to which the term nimbus has properly been applied.* This

* This application of the word nimbus corresponds very well with the sense in which it was taken by some of the old Roman writers, who considered it as a stormcloud, and distinguished from imber or a shower of rain actually falling. Thus Lucretius—

Copia nimborum, turba majore coacta

Urguens ex supero premit ac facit effluere imbris.

Lucr. de Rer. Nat. vi. 512.

change seems to consist in the uniting of particles of water differently electrified, which, having a mutual attraction for each other, closely unite, forming visible drops of water, which therefore gravitate and descend in rain. The nature of this process will, perhaps, be better understood if I advert to what frequently happens in the rapid production of showers. The cumulus, sailing along in a lower region, appears retarded in its progress, increases upwards, and inosculates with a cirrus or cirrostratus above; then the whole changes into cumulostratus, and spreads horizontally, forming a dense sheet; a sort of crown of cirrose fibres extends upward from the superior part, while loose flocky cumuli, entering from below, seem to nourish the growing nimbus, which, increasing in density, at length descends in rain, the drops or streams of which appear, by inosculatation in falling, to acquire magnitude in their progress to the earth. After the storm has spent itself, the mass is again disunited, and formed into the different modifications: the cirrus, cirrocumulus, and cirrostratus, may again be seen in the higher air, while the remaining part of the broken nimbus flies along in a lower station, in the form of that loose, flocky, and

dark coloured cumulus which the sailors call scud. In cases of more settled and continued rain, these processes go on slower, and therefore are less likely to be taken notice of. The best time for viewing the progress of nimbification is in stormy weather; cumuli may then be seen rising into mountains and becoming cumulostrati, while long strata of cirrostratus permeate their summits; and the whole phenomenon has the appearance of a range of mountains, transfixed by the mighty shafts of giants. After having existed some while in this form, they become large and irregular, and they get darker by intensity, till all seem concentrated in a dense black mass, with a cirrose crown extending from the top, and ragged cumuli entering from below; and eventually the whole resolves itself into rain.*

* Previous to the coming up of a storm, a dead calm, which may have for some time existed, is followed by a gale. The approach of a storm, thus ushered in by wind, is admirably described by Virgil:

Qualis ubi ad terras abrupto sidere nimbus
It mare per medium; miseris heu praescia longe
Horrescunt corda agricolis: dabit ille ruinas
Arboribus stragemque satis, ruet omnia late
Antevolent sonitumque ferunt ad littora venti.

Virg. Aeneid. xii. 451.

Having in this section given a sketch of the modifications, and of the principal circumstances which relate to their formation and peculiarities, I proceed in the next to a further examination of the same subject.

SECTION IX.

By what has been said above, it appears that, according to M. Howard's theory, the origin of clouds is from the surface of the earth and waters. That the vapour upraised by the accession of the diurnal temperature, in the manner described, is condensed into a visible cloud, either by cold, or by the air, from other causes; losing its power of holding so much water in solution as before; or by the joint influence of these causes. That cumuli are the immediate result of this process; and that in the evening, when the heat is diminished, the air deposits its vapour again in the form of dew, which gravitates to the ground, becoming more dense as it approaches the earth, because the lower atmosphere is now the coolest; and finally lodges on the surface of the herbage, or of the ground, where it awaits the reascending sun to be again eva-

porated. Cumuli also are represented to be dispersed, and their constituent particles to come to the ground in the same manner.* According to the same theory, it appears that the other modifications are also the consequence of vapour carried up into the atmosphere, while their peculiarities are more immediately affected by the agency of the electric fluid.

The conclusion of M. Howard's theory, as it is given in Rees's *Cyclopædia*, is so good, that I shall adopt it as a termination to this section.

“We shall conclude with a brief review of the modifications ascending from the STRATUS, formed by the condensation of vapour on its escape from the surface to the CUMULUS, collecting its water in the second stage of its ascent, both probably existing by virtue of a positive electricity. From these proceeding through the partially conducting CUMULOSTRATUS to the CIRROSTRATUS and CIRROCUMULUS; the latter positively charged, and considerably retentive of its charge; the former less perfectly insulated, and, perhaps, conducting horizontally:

* Although the reason of their sinking may be the destruction of the vapour plane in the evening, yet some other cause must exist for the cumulus to disperse and fall in diffused mist, or dew: see the next Chapter.

we arrive thus at the region where the CIRRUS light and elevated obeys every impulse or invitation of that fluid, which, while it finds a conductor, ever operates in silence, but which, embodied and insulated in a denser collection of watery atoms, sooner or later bursts its barrier, leaps down in lightning, and glides through the NIMBUS from its elevated station to the earth."

SECTION X.

THOUGH the above theory appears very plausible, and is certainly in many respects accurately correct, yet there are other theories which are opposed to it in many particulars, and which seem likewise to have some pretensions to credit. I shall proceed next to mention some of these, and compare them with that of M. Howard. It is contended by some that the dew does not fall, but, on the contrary, rises: the earth, it is said, retains the heat of the day longer than the air immediately above it: that evaporation being greater, according to the proportion of heat which the water bears to the air into which it evaporates, there becomes

a considerable evaporation from the earth and waters in the evening, which is condensed again in the cold air. I readily allow that this may take place; but it does not appear to me to militate against what has been advanced in the preceding Section. Evaporation may still be going on from below, while there is a precipitation from above; and thus we may account for the stratus not always resting on the ground, but frequently beginning at a small distance from it, or increasing in density for some feet upwards, there being a sort of shallow vapour plane preserved so long as the heat continued to be slowly transmitted from the earth.

M. De Luc asserts that clouds are not the constant result of evaporation from the earth. He accounts for them by supposing that the air is decomposed by the sun's rays, so as to deposit aqueous particles, which become clouds. If this be admitted to take place, it does not argue against the ascent of vapour: and whether the watery particles arise immediately from the ground, or are deposited by the air, they may equally be supposed capable of becoming cloud when operated upon by the nubific principle, which is believed to be electrical: indeed, these

two processes may co-operate to the production of clouds, so that, if this hypothesis be advanced against M. Howard's theory, it cannot be regarded as constituting a valid objection.*

* The following extract will, perhaps, furnish to the reader a more perfect idea of M. Howard's theory of the origin of clouds:

“ On the remote and universal origin of clouds there can be but one opinion—that the water of which they consist has been carried into the atmosphere by evaporation. It is on the nature of this process, the state in which the vapour subsists for a time, and the means by which the water becomes again visible, that the greatest diversity of opinion has prevailed.

“ The chemical philosopher, seduced by analogy, and accustomed more to the action of liquids on solids, naturally regards evaporation as a solution of water in the atmosphere, and the appearance of cloud as the first indication of its precipitation; which becoming afterwards (under favourable circumstances) more abundant, produces rain. The theory of Dr. Hutton goes a step further, assumes a certain rate of solution differing from that of the advance of temperature by which it is effected, and deduces a general explanation of clouds and rain from the precipitation which, according to his rule, should result from every mixture of different portions of saturated air. The fundamental principle of this theory has been disproved in an essay heretofore presented to the society,* and which was written under the opinion, at present generally adopted by chemists, that evaporation depends on a solvent power in the atmosphere, and follows the general rules of chemical solution.

* See Phil. Mag. vol. xiv. p. 55.

It is said again, that nimbi have been observed to take place without the precurrence of other

“The author has since espoused a theory of evaporation which altogether excludes the abovementioned opinion (and consequently Dr. Hutton’s also), and considers himself in a considerable degree indebted to it for the origin of the explanation he is about to offer. It will be proper, therefore, to state the fundamental propositions of this theory, with such other parts as appear immediately necessary, referring for mathematical demonstrations and detail of experiments to the work itself, which is entitled “Experimental Essays on the Constitution of mixed Gases; on the Force of Steam or Vapour from Water and other Liquids, in different Temperatures, both in a Torricellian Vacuum and in Air; on Evaporation; and on the expansion of Elastic Fluids by Heat. By John Dalton.”—See Memoirs of the Literary and Philosophical Society of Manchester, vol. v. part 2.—The propositions are as follow:

‘1. When two elastic fluids, denoted by A and B , are mixed together, there is no mutual repulsion amongst their particles; that is, the particles of A do not repel those of B , as they do one another. Consequently, the pressure or whole weight upon any one particle solely arises from those of its own kind.

‘2. The force of stream from all liquids is the same at equal distances above or below the several temperatures at which they boil in the open air; and that force is the same under any other pressure of another elastic fluid as it is in *vacuo*. Thus the force of aqueous vapour of 212° is equal to 30 inches of mercury; at 30° below, or 182° , it is of half that force; and at 40° above, or 252° , it is of double the force: so like-

modifications; but I have seen it no where proved, that after their formation rain has gone

wise the vapour from sulphuric ether, which boils at 102° , then supporting 30 inches of mercury, at 30° below that temperature it has half the force, and at 40° above it, double the force: and so on in other liquids. Moreover, the force of aqueous vapour of 60° is nearly equal to half an inch of mercury when admitted into a Torricellian vacuum; and water of the same temperature, confined with perfectly dry air, increases the elasticity to just the same amount.

‘ 3. The quantity of any liquid evaporated in the open air is directly as the force of stream from such liquid as its temperature, all other circumstances being the same.’ ”

The following is a part of the essay on evaporation:

“ When a liquid is exposed to the air, it becomes gradually dissipated in it; the process by which this effect is produced we call *evaporation*.

“ Many philosophers concur in the theory of chemical solution: atmospheric air, it is said, has an affinity for water; it is a menstruum in which water is soluble to a certain degree. It is allowed, notwithstanding, by all, that each liquid is convertible into an elastic vapour *in vacuo*, which can subsist independently in any temperature: but as the utmost forces of these vapours are inferior to the pressure of the atmosphere in ordinary temperatures, they are supposed to be capable of existing in it in the same way as they do in a Torricellian vacuum: hence the notion of affinity is induced. According to this theory of evaporation, atmospheric air (and every other species of air for aught that appears) dissolves water, alcohol, ether, acids, and even metals. Water below 212° is chemically combined with the gases; above 212° it assumes a

on without a cirrose crown on the upper part of the nimbus. I have noticed the spon-

new form, and becomes a distinct elastic fluid, called *steam*: whether water first chemically combined with air, and then, heated above 212° , is detached from the air or remains with it, the advocates of the theory have not determined. This theory has always been considered as complex, and attended with difficulties: so much that M. Pictet and others have rejected it, and adopted that which admits of distinct elastic vapours in the atmosphere at all temperatures, uncombined with either of the principal constituent gases, as being much more simple and easy of explication than the other; though they do not remove the grand objection to it, arising from atmospheric pressure."

On the Evaporation of Water below 212° .

"I have frequently tried the evaporation at all the temperatures below 212° : it would be tedious to enter into detail of all the experiments, but I shall give the results at some remarkable points. In all the high temperatures I used the vessel abovementioned,* keeping a thermometer in it, by which I could secure a constant heat, or at least keep it oscillated within narrow limits.

"The evaporation from water of 180° was from 18 to 22 grains per minute, according to circumstances; or about one half of that at 212° .

"At 164° it was about one third of the quantity at the boiling temperature, or from 10 to 16 grains per minute.

* This refers to experiments on the evaporation of water at 212° , for which see the Essay.

taneous formation of nimbi more than once. Of this I shall say more hereafter, when I shall

“ At 152° it was only one fourth of that at boiling, or from 8 to 12 grains, according to circumstances.

“ The temperature of 144° affords one fifth of the effect at boiling; 138° gave one sixth, &c.

“ Having previously to these experiments determined the force of aqueous vapour at all the temperatures under 212° , I was naturally led to examine whether the quantity of water evaporated in a given time bore any proportion to the force of vapour of the same temperature, and was agreeably surprised to find that they exactly corresponded in every part of the thermometric scale; thus the forces of vapour at 212° , 180° , 164° , 152° , 144° , and 138° , are equal to 30, 15, 10, $7\frac{1}{2}$, 6, and 5 inches of mercury respectively: and the grains of water evaporated per minute in those temperatures were 30, 15, 10, $7\frac{1}{2}$, 6, and 5, also; or numbers proportional to these. Indeed it should be so from the established law of mechanics, that all effects are proportional to the causes producing them. The atmosphere, it should seem, obstructs the diffusion of vapour, which would otherwise be almost instantaneous, as in *vacuo*; but this obstruction is overcome in proportion to the force of the vapour. The obstruction, however, cannot arise from the weight of the atmosphere, as has till now been supposed; for then it would effectually prevent any vapour from arising under 212° ; but it is caused by the *vis inertiae* of the particles of air, and is similar to that which a stream of water meets with in descending among pebbles.

“ The theory of evaporation being thus manifested from experiments in high temperatures, I found that if it was to be verified by experiments in low temperatures regard must be

attempt further to illustrate these subjects by a detail of some particular cases.—In the conclusion

had to the force of vapour actually existing in the atmosphere at the time. For instance, if water of 59° were the subject, the force of vapour of that temperature is 1-60th of the force at 212° , and one might expect the quantity of evaporation 1-60th also: but if it should happen, as it sometimes does in summer, that an aqueous atmosphere to that amount does already exist, the evaporation, instead of being 1-60th of that from boiling water, would be nothing at all. On the other hand, if the aqueous atmosphere were less than that, suppose one half of it, corresponding to 39° of heat, then the effective evaporating force would be 1-120th of that from boiling water: in short, the evaporating force must be universally equal to that of the temperature of the water, diminished by that already existing in the atmosphere. In order to find the force of the aqueous atmosphere, I usually take a tall cylindrical glass jar, dry on the outside, and fill it with cold spring water fresh from the well: if dew be immediately formed on the outside, I pour the water out, let it stand a while to increase in heat, dry the outside of the glass well with a linen cloth, and then pour the water in again: this operation is to be continued till dew ceases to be formed, and then the temperature of the water must be observed; and opposite to it in the table will be found the force of vapour in the atmosphere. This must be done in the open air, or at a window; because the air within is generally more humid than that without. Spring water is generally about 50° , and will mostly answer the purpose the three hottest months in the year; in other seasons an artificial cold mixture is required. The accuracy of the result obtained this way I think scarcely

of this chapter, I may observe, that if, agreeable to the experiments of modern chemists, the con-

needs to be insisted upon. Glass, and all other hard, smooth substances, I have tried, when cooled to a degree below what the surrounding aqueous vapour can support, cause it to be condensed on their surfaces into water. The degree of cold is usually from 1 to 10 below the mean heat of 24 hours; in summer I have often observed the point as high as 58° or 59° , corresponding to half an inch of mercury in force; and once or twice have seen it at 62° ; in changeable and windy weather it is liable to considerable fluctuation: but this is not the place to enlarge upon it.

“ For the purpose of observing the evaporation in atmospheric temperatures I got two light tin vessels, the one six inches in diameter and half an inch deep, the other eight inches diameter and three fourths of an inch deep, and made to be suspended from a balance. When any experiment, designed as a test of the theory, was made, a quantity of water was put into one of these (generally the six-inch one, which I preferred), the whole was weighed to a grain; then it was placed in an open window or other exposed situation for 10 or 15 minutes, and again weighed to ascertain the loss by evaporation; at the same time the temperature of the water was observed, the force of the aqueous atmosphere ascertained as above, and the strength of the current of air noticed. From a great variety of experiments made both in the winter and summer, and when the evaporating force was strong and weak, I have found the results entirely conformable with the above theory. The same quantity is evaporated with the same evaporating force, thus determined, whatever be the temperature of the air, as near as can be judged; but with the

version of fluids into elastic vapour is attended with a loss of heat; the vapour from water, by

same evaporating force, a strong wind will double the effect produced in a still atmosphere. Thus, if the aqueous atmosphere be correspondent to 40° of temperature and the air be 60° , the evaporation is the same as if the aqueous atmosphere were at 60° of temperature and the air 72° ; and in a calm air the evaporation from a vessel of six inches in diameter in such circumstances would be about $\cdot 9$ of a grain per minute, and about $1\cdot 8$ grains per minute in a very strong wind; the different immediate quantities being regarded solely by the force of the wind.

“ Having quoted so much of this essay as may suffice to exhibit the principles on which we may proceed, it may be useful, before we do this, to recapitulate the following circumstances respecting the atmosphere of aqueous gas, or (for brevity) the aqueous atmosphere.

“ 1st. It is supplied by the process of evaporation, which by this theory appears to be reduced to the immediate union of water with caloric into a binary compound, *aqueous gas*.

“ 2dly. The supply of vapour (by which term, for the purposes of meteorology, we may denote aqueous gas,) is regulated by the following circumstances:—1. Temperature of the evaporating water, being greater as this is higher, and *vice versâ*. 2. Quantity of surface exposed. Since it is from the surface only of the mass that the vapour in common cases can escape, the supply is in direct proportion thereto. 3. Quantity of vapour already subsisting in the atmosphere: the evaporation being less (with equal temperature and surface) in proportion as this is greater, and *vice versâ*.

“ 3dly. The vapour thus thrown into the atmosphere is diffusable therein by its own elasticity, which suffices for its

rendering the upper atmosphere into which it ascends cooler than it was before, also renders

ascent to any height in a perfect calm. Yet, as in this case the *inertia* of the particles of air considerably resist its diffusion, so in the opposite one of a brisk current, the vapour, by the same rule, must in some measure be drawn along with the mass into which it enters.

“ 4thly. The quantity of vapour which, under equal pressure, can subsist in a given mass of air, will be greater as the common temperature is higher, and *vice versâ*.

“ Aqueous vapour is the only gas contained in the atmosphere which is subject to very sensible variations in quantity. These variations arise from its attraction for caloric being inferior to that of all the others. Hence when a cold body, such as the glass of water in the experiment above quoted, is presented to the atmosphere, the other gases, composing the latter, will only be cooled by it (and that at all known temperatures); but the vapour, after being more or less cooled, will begin to be decomposed, its caloric entering the body while the water is left on the surface.

“ The formation of cloud is in all cases the *remote* consequence of a decomposition thus effected, except that the caloric escapes, not into a solid or liquid, but into the surrounding gases.

“ Dew is the *immediate* result of this decomposition. The particles of water constituting it are, singly, invisible, on account of their extreme minuteness. The approach of dew is, nevertheless, discoverable by a dark hazy appearance, verging from purple to faint red, extending from the horizon to a small distance upwards, and most conspicuous over valleys and large pieces of water.

it less capable, agreeable to M. Howard's theory, of containing so much aqueous gas in solution, which thus contributes to effect its own condensation into clouds: by which process there is produced again an increase of heat; and by this means the degree of temperature is in some measure restored.

“ The theory of dew seems to be simply this:—during the heat of the day a great quantity of vapour is thrown into the atmosphere from the surface of the earth and waters. When the evening returns, if the vapour has not been carried off in part by currents, it will often happen that more remains diffused in the general atmosphere than the temperature of the night will permit to subsist under the full pressure of the aqueous atmosphere. A decomposition of the latter then commences, and is continued until the general temperature and aqueous pressure arrive at an equilibrium, or until the returning sun puts an end to the process. The caloric of the decomposed vapour goes to maintain the general temperature; while the water is separated in drops, which, minute as they are, arrive successively at the earth in the space of a few hours. That the ordinary production of dew is by a real *descent* of water from the atmosphere, and not by decomposition of vapour on surfaces previously cooled (as in the experiment already mentioned) any one may readily be convinced by observing in what abundance it is collected by substances which are wholly unfit to carry off the requisite quantity of caloric for the latter effect.”—*Phil. Mag.* Sep. 1803.

CHAPTER II.

FURTHER OBSERVATIONS ABOUT THE PECULIARITIES OF THE CLOUDS.

IN the foregoing chapter I have given a hasty and imperfect sketch of M. Howard's theory of the origin, suspension, and destruction of clouds. I shall next proceed to examine further the various appearances which the different modifications present in the progress of their formation, changes, and destruction; the influence which they appear to have on each other, and the connexion observable between their peculiarities and other atmospheric phaenomena. The reader will see how far these phaenomena are reconcileable with what has been already said in the above chapter. In investigating the causes of these changes, I have selected such few cases as appeared necessary to illustrate them, and for further particulars I refer to the Appendix at the end of the volume, and to my journal in the Philosophical Magazine. In this

journal, it may be said, I have been too minute in the detail of appearances. But where effects are intricate and complex, an accurate detail of them appears the only thing that can lead to a knowledge of their particular causes.

SECTION I.

Of the Varieties of the Cirrus.

I HAVE already said that the Curlcloud was by no means uniform in its appearance; but, on the contrary, that it exhibited a very great variety of figure, both while it remained a determinate cirrus, and when passing to the other modifications. That these varieties are the effect of a variation in the cause of the cloud, cannot be doubted; many of them are attendant upon particular kinds of weather; and an accurate examination of them, compared with other coexisting phaenomena, seems likely to throw additional light on the nature of the peculiar office which the cirrus performs; namely, that of conducting the electric fluid.

When the weather is dry, the cirrus has more of a fibrous texture than when it is damp; and whatever may be its figure, whether

comoid, linear, or filiform, its extremities are always fine evanescent points. This is a fact very conformable to our present idea of its nature. For when surrounded by dry air, which is an electric, there is not a free passage for communication; and the cirrus necessarily assumes that form which is best calculated for conducting, the evanescent terminations being probably points for the transmission of the fluid, and they are directed towards that part of the sky with which the electric communication is to take place.

On Friday, the 30th of August, 1811, the air being very dry, according to the hygrometer, the cirri were spread about in a lofty region; they were of a fibrous texture, one end terminating in transmitting points, the other frequently more massy; they passed on gently with the wind, in succession; by the evening none were to be seen. Cumuli also, formed during the day in a lower atmosphere, moved along in the N. W. current, and likewise disappeared at night. The dryness of the air might be the reason why these two kinds of clouds did not unite and produce cumulostratus. At night cirrocumulus floated over from S. W.

In wet weather, when the air is damp, the

cirrus, which is seen in the intervals of the rain, is ill defined, and often of a sort of plumose figure; and it has less of the fibrous structure: this may be attributed to its being surrounded with moister air, which being a conductor, though an imperfect one, there is not the same necessity for the cirrus to be drawn out into fine transmitting points; as the fluid can fly off more generally from all parts of it. Cirri of this kind are generally of short duration, and have a great tendency to change into the other modifications; there is often a haziness in the atmosphere when they appear, and they are frequently soon followed by Rain. They seldom appear in fair dry weather; and if cirri, which have been previously fibrous, put on the plumose and indefinite character, a change to wet weather may be expected. All these are circumstances which corroborate the opinion, that the humidity of the circumjacent air is the cause of this kind of feature of the cirrus, and agree very well with the nature of the office already assigned to it.

I have almost always found the fibrous cirri to be accompanied by dry air. But there are rare exceptions to this rule. The upper air may, however, be tolerably dry, while the under air is moister, which may account for the occa-

sional appearance of cirri of fibrous texture above, at a time when the hygrometer indicates a humid atmosphere below.

The plumose cirrus often appears when the sky is deep blue, and the cirrus of fibrous structure sometimes appears when it is pale coloured. But the intensity of the blue of the sky does not seem to depend on the dryness of the air; nor the paleness, on its moisture. In the intervals of showers the intensity of the blue is often the greatest.* While I am now writing, I observe out of my window abundance of fibrous cirri in a sky rather pale than otherwise. During the abundance of cirri I have sometimes perceived the sky particularly pale; which, on minute examination, have been found to be caused by innumerable fine fibres of cirrus lying very close together.

There is a variety of the cirrus, called in Lincolnshire the Sea Tree, which has somewhat of the plumose structure, and generally precedes Rain. Its figure gives a faint resemblance to that of a tree, whence it derives its name, one end being a compact kind of trunk, from which

* Sir Isaac Newton somewhere observes that the deepest blue sky happens just at the change from a dry to a moist atmosphere.

fibres diverge and ramify into confused or plumose branches.*

The obliquely descending bands of cirrus, before mentioned, which occur chiefly in fair warm weather with light gales of wind, are not always detached. I have seen them proceeding from other clouds, and sometimes connecting two distant masses of cloud, which in this case have always been undergoing a change of appearance, reconcileable with the idea of a change in their electric state.

The detached comoid cirri, called Mares' Tails, are seldom very much elevated, particularly those which ramify vertically. Their presence is well known to be an indication of wind; and when their transmitting terminations have a decided direction, the subsequent wind has been often found to blow from the quarter to which they have previously pointed. This circumstance seems difficult of explanation. For if we suppose a current of air, differently electrified, to precede the more violent and sensible wind that is to follow, with which the cirrus communicates its electricity by means of

* By plumose, is meant a figure which gives the idea of the folded ends of a plume of feathers. The sea tree sometimes looks like many of these plumes diverging from one stem.

these pointing fibres; how comes the cirrus itself, though apparently stationary, to be actually moving on slowly in an opposite direction? which I have observed to be the case; and, indeed, cirri in general move along with their tails either foremost or aslant. If these cirri, then, be moved along by the current of air, it cannot be imagined that there can be a current of differently electrified air meeting them, which should draw out their tails into transmitting points. For if two currents meet, which ever was strongest would counteract the other, and would move the cirrus at the rate of the difference of the two velocities. It is difficult, too, to suppose that there can be a tide of electricity moving against the wind; but it is possible that the cirrus may not be carried forward by the mechanical impulse of wind. The same electric attraction, which may draw out its cirriform tail for the purpose of equalization, may, be supposed, furthermore, to move slowly the whole mass in the same direction. I never could quite satisfy myself on this point. Perhaps the electric attraction, which draws out the cirrus into transmitting points, exercises its power quite independent of the wind then blowing; for these cirri sometimes move in a

direction very different from the direction of their tails: besides, the cirrus has been observed to continue moving on, in the same direction, while the tails have veered round toward another quarter.*

There is sometimes a kind of motion observable in the cirris, which I have never noticed in any other cloud, which it is somewhat difficult to describe, and which, whenever I have seen it, has happened in a cirrus of a particular kind; namely, in one which has a sort of plumose extremity, with a long fibrous body, and a fine transmitting pointed tail.† The plumose head, which under these circumstances is clearer and rather more fibrous than usual, together with the body, seem all in motion, as if every particle was alive. This motion may be compared to that of a piece of cheese full of mites, which seems agitated in every point, without ever materially changing its place. This was re-

* Whether by the fleeces of wool, which Aratus, Virgil, and Lucretius speak of, as being carried across the welkin in rainy weather, were intended these comoid cirri, cirrostrati, cirrocumuli, or large flocky scud, is uncertain. They intended, however, to describe the peculiar clouds which accompany variable weather.

† Plate I. Fig. 2.

markably conspicuous in some cirri, which I saw from Farningham, in Kent, about 6 o'clock Tuesday evening, the 16th of July, 1811. They pointed nearly to the East. The weather which preceded them was variable, with some showers, and they were succeeded by several days of fair dry weather with various clouds, at the end of which time happened a hard thunderstorm about three in the morning. Can this motion possibly be the effect of an effort on the part of the electrified particles of the cloud, to equalize their own electricity with that of the air? or may there be some disturbance in the electricity within the cloud, from other causes? Sometimes portions of the cloud seem lightly agitated, as if by partial but gentle draughts of wind. Can the motion alluded to be caused by the evolution of any air generated in the cloud?

When the cirrus ceases to conduct, it changes its form, and becomes some other cloud, as has been said: thus, sometimes a sky full of cirrous streaks, after a while becomes overspread with a milky whiteness. This is a sort of change to cirrostratus, which often ends in Rain.*

* The Abbé Bertholon probably alludes to the cirrus, as well as to scudlike cumulus, and other transitory features of the modifications, which appear in the intervals of showers,

The cirri however frequently change to the cirrocumulus; and in the progress of the change the cirrous fibres seem to shoot out laterally into transverse and intersecting streaks, they first change to cirrocumulus at their points of intersection, which thicken, approach to the orbicular form, and seem like centres from which fibres eradiate; thus a sort of stelliform cirrocumulus is effected, which either goes on changing into a more perfect feature of that cloud, or changes again to cirrus or to cirrostratus, or evaporates. It often happens that, as the cloud is gently moving on, the spectator has not an opportunity of watching it throughout all its metamorphoses.

when he speaks of the “*Lambeaux et fragments de nuages qui sont comme disseminés dans les différentes regions de l’air, les uns sont plus hauts (cirri, &c.) les autres plus bas (scud, &c.) et flottent au gre des vents de divers côtés.*” He speaks of them as vehicles of the electric fluid, and as useful in conveying away the matter of lightening, which would otherwise be oftener embodied in large clouds, and strike the earth with terrible violence. Thus he seems to have had some faint notion of an office performed by clouds, which more recent discoveries have ascribed to the cirrus. See *Berthol. De l’Elec. Met. t. II. p. 113.*

SECTION II.

Of the Varieties of the Sondercloud.

THE permanent features of any cloud should be distinguished from those which are only transitory, or which the cloud exhibits in the progress of its change from one modification to another. I have before noticed, that in the change from the cirrus to the cirrocumulus, a number of appearances present themselves, which cannot be referred to either. They generally, however, end in a determinable modification, which I call its permanent form; and in which it generally remains for some time, and then evaporates, or changes again. The permanent features of the cirrocumulus vary at different times, and the varieties are connected with particular states of the atmosphere. In fine warm weather in summer, particularly towards evening, the nubeculae which compose this cloud are often large, well defined, and separate from each other: the whole sky is sometimes replete with them. This feature is often the forerunner of fine and wholesome, after a long continuation of wet and variable,

weather: it is strikingly contrasted to that variety of Sondercloud which is composed of very diminutive nubeculae; by which the sky seems sometimes peppered, if I may so express myself, with innumerable little round white specks, which are sometimes of so light a texture as to be almost transparent. There is a sort of cloud of this latter sort, which, though its nubeculae preserve something of the round shape of the cirrocumulus, has the light and flimsy appearance, and almost the transparency of cirrostratus of one kind, and it becomes very difficult to know what name to give it. Refer to the tenth section of this chapter.

In stormy weather, previous to thunder, a cirrocumulus often appears, whose component nubeculae are very dense and compact round bodies in very close arrangement. The prevalence of this feature, particularly when accompanied by cumulostratus, is a sure indication of an approaching storm.*

* If the cirrocumulus, as M. Howard supposes, be a cloud positively charged and very retentive of it, the intensity and decided character of this feature indicates the very high state of its charge; this notion agrees very well with the circumstance of its accompanying thunderstorms. Are not the densist Twainclouds formed from its conjunction with the cumulus?

I have often had occasion to mention the cirrocumulus, as being very generally a foreboder of warmth. In Germany these clouds are called little sheep: and Professor Heyne has a note on them in his edition of Virgil.* And our poet Bloomfield has likewise compared them to a flock at rest, in a passage already cited. In certain weather cirrocumulus rapidly forms in different places in the sky, and soon subsides again, as mentioned in another place.

SECTION III.

Of the Varieties of the Wanecloud.

IT would be impossible to convey to the reader a complete detail of all the varieties of any cloud; for, as in every other natural production, no two appear exactly similar in all particulars of shape, size, and situation. But as the clouds, countless and innumerable as their shapes and sizes are, have a tendency, under certain circumstances at present not precisely known, to break out into some of the seven

* Heyne's Virgil, 4 vols. 8vo. Lips. 1803, and Georg. i. 97, p. 314 of vol. i.

distinct modifications; so each modification has certain particular varieties into which it forms itself on different occasions, and the meteorological speculator may be assisted, by having some of the principal of these pointed out to him.

The varieties of the cirrostratus are numerous; but throughout all of them this cloud preserves its distinguishing characteristics; namely, shallowness, and extent in proportion to the quantity of its substance; generally a horizontal position, and a tendency to alter its form and to subside. It is often lower down than a cirrus in the same sky, and a change from that cloud to cirrostratus is usually attended with a diminution of its altitude, a greater degree of density in its fibres, and in a more regularly horizontal position. The plane sheets of Wanecloud are the most simple of its forms; when these are not extensive, and are seen in the distance, they often look like a dense streak drawn along near to the horizon; but distinguishable from streaks of cirrus. There are some peculiar appearances of this kind, which, swelling somewhat in the middle, and seen below a more thin and extensive sheet of cloud, give the idea of the back of a great Dolphin rising out of the Ocean. It is in the thin and

extensive sheets of this cloud, covering the welkin before its condensation into water, that the Halo appears.* It is this cloud which, under some known circumstances of atmospheric change, first in a diffused form obscures the sky, giving the sun, moon, or stars that dim light, and those peculiar refractions, spoken of in another place, and which often eventually becomes nimbiform, and ends in gentle and continued Rain. The sun often sets apparently shrouded in a dense feature of this modification, and this is a sure indication of a wet morning. But let us turn to more elegant varieties of the Wanecloud, which sometimes appear in longish irregular spots, or in bars in close horizontal position.† Features of this kind are frequently of short duration, and move along very slowly in a high atmosphere, and appear subsiding by degrees; while perhaps other beds of it are forming in other places: a feature much like this appears in the intervals of Showers.‡ There also appears in variable weather, and before

* See Chapter III. † Pl. II. Fig. 2.

‡ What is called the mackerelback sky often consists of this feature spread over a large portion of the firmament: but a sort of cirrocumulus, in like manner spread aloft, likewise receives this whimsical appellation.

Storms, a feature of cirrostratus, like the cyma of architecture.* I have seen cirrostratus which did not lie, as it usually does, in a horizontal plane. A feature occurred on the 5th of March, 1810, in the North East, which was a long tapering inclined and curved column of dark lakecoloured specks; above it were cirri scattered about like loose hay. But to describe the cirrostratus in all its varieties of mottles, specks, streaks, and lines, would swell too much this chapter, and the meteorologist must observe them for himself.

SECTION IV.

Of the Varieties of the Stackencloud.

CUMULI vary in size and in the regularity of their forms; they have all the tendency to assume an irregular hemespherical figure: those which attend fair settled weather, which form soon after sunrise, become large and inosculate into extensive masses in the middle of the day, and subside in the evening, are of the most

* Pl. III. Fig. 2.

regular shape. When they increase rapidly, and become more irregular, with fleecy bases, they will soon be cumulostrati, and are to be considered as indicating variable or wet weather: in this case they are lower down in the air, and of denser appearance. In the intervals of, and before showers, I have seen them very large, and yet moving along in the wind, like immense hemispheres of cloud, dense in the middle, with silvery summits, and constantly tending to become cumulostratus, and to reproduce the Showers; which, when they last long, are nourished by dark flocky cumuli, entering into the raining nimbus from below. See Pl. V. Fig. 2.

Some of these little Stackenclouds are not so fleecy as the rest; they are more compact in form, and, flying along rapidly between the Showers, are considered as a foreboding of their return, and are called, by the vulgar, water waggons. The cumuli before keen March Showers of Snow, with North and East winds, have that look of transparency, and that definite though rugged edge, described in another place, as happening also to cumulostratus. Cumuli have sometimes appeared as it were tuberculated, and, though of their usual hemispherical sort of form, to be

composed of numerous eminences, or lobes of cloud. I have not observed what peculiarities of weather these cumuli accompany.

It is curious to watch the formation of cumuli in the morning, and trace them, when it is possible, from the minute specks of cloud which, here and there, seem to form out of the atmosphere, to those large masses which move majestically along in the wind, and convey water from place to place for the irrigation of the earth. In fair weather, soon after sunrise, a small cloud appears; this increases, others form near it, and they fall into one another as if attracted; a large mass is at length upraised, and then all the smaller ones which form in its neighbourhood are soon lost, while the large one is augmented, and the spectator, though he seldom sees it in actual congression, feels no doubt that the disappearance of the smaller, and augmentation of the larger cloud, be owing to the larger mass having attracted the smaller into itself. It becomes a question, however, why the smaller clouds are lost to appearance before they reach and are quite drawn into the larger one? Possibly when the small cloud is very near with most of its vapours drawn away, the rest rush into the larger; as a magnet, when

it has approached a larger one within a certain distance, is forcibly and suddenly attracted to the latter. When these ephemeral mountains of electrified vapour have increased much, as they do towards the middle of the day, large ones often inosculate, and form dense and extensive irregular masses. Something else besides this, however, seems necessary to cause that density and continuity of a base, common to several superstructures which constitute cumulostratus.

The rapid formation and disappearance of small cumuli is a process constantly going on in particular kinds of weather, particularly when the air is clear and dry, with light Easterly breezes. These little Stackenclouds seem to form out of the atmosphere, and to be resolved again as rapidly into it.

On the elevation of a Fallcloud in the morning, we often see cumuli forming at its upper part; probably the same particles of vapour, on the return of the vapour plane, take the form of the cloud of day, and subside in fog again in the evening See Plate II. Figs. 3, 4.

SECTION V.

Of the Varieties of the Fallcloud.

THOUGH most meteorological philosophers now concur in the general idea that dews and fogs are the result of vapour precipitated by the nocturnal decrease of temperature; yet the particular circumstances under which dew is formed in greater or less quantities, the time of night, and the kind of weather when it is most precipitated, and other facts relating to it, having been variously observed by different persons, have occasioned different views to be taken of their various causes. In this section, however, I shall confine myself to a few cursory observations on the varieties of appearance which the stratus presents.

Every body must have noticed the difference between the wet fogs (probably cirrostrati) which happen at all times of day, but often of a morning,* and the white mists which wet nothing, but only leave dew in drops on the herbage,

* In Cornwall they amount to fine Rain almost; they call them the Pride of the Morning. Fine days frequently follow them.

which veil the meadows and vallies through a summer night, and ascend in the morning. As the temperature decreases in autumn, the stratus becomes thicker; the rays of the sun seem hardly able to overcome it, and it sometimes lasts throughout whole days; thus it gave rise in the minds of the ancients, whose organization led them to express physical facts metaphorically, to the fable of Phoebus and Python.*

In the neighbourhood of great cities these fogs, impregnated with numerous effluvia and smoke, have a yellow appearance which is explainable; but even in country places the yellow fogs of November extend over large tracts of land.

Dense fogs also happen sometimes, which appear suddenly, in different places; while at other times fogs continue for weeks together; such as that very thick and long fog, though

* Thus Phoebus, or the sun, is solicited by Cupid or love the vernal influence to court Daphne, and effect the fruits of love in summer's productions. He boasts to the little god of his recent victory over Python, that is, the fog spreading his pestiferous body over the meadows.

“ Qui modo pestifero tot jugera ventre prementem
Stravimus innumeris tumidum Pythona sagittis.”

Ovid. Met. II. 10.

one that did not extend very high, which in December, 1813, ushered in the long frost, that continued through January and February of the succeeding year. This fog seems by its topological history to have travelled from the West, Eastward, and Northward over our island. See some curious remarks about fogs, and particularly the extraordinary fog in France of 1783, in Bertholon, *Dè l'Electricité des Meteors*, Tom. II. Chap. 4, where the observations of different persons on this phaenomenon are duly noticed.

SECTION VI.

Of the Varieties of the Twaincloud.

WHETHER this cloud is formed with visible conjunction of different modifications, whether cumuli spontaneously assume its form, or whether it appears of itself previously, we must regard it as a stage towards nimbus. The very dense and black appearance of this cloud coming up with the wind, and just ripening into a Storm, must be familiar to every body. Where the Rain has actually begun to fall, the blackness

is changed for a more obscure and grey colour. This may be only the effect of the interposed water of the falling Rain; but if not, and if the nimbus be effected by an intense union of the watery particles, as I at present believe, the intense blackness of the previous cumulostratus must depend on some other principle. The mountains of this cloud, and its different appearances are mentioned in another place.

SECTION VII.

Of Nimbi which result from the visible Coalescence of distinct Clouds.

AN artificial division may be made of nimbi into three kinds. Firstly; those which result from the visible coalescence of distinct clouds. Secondly; those which follow the interfusion of moisture between distinct clouds: and, thirdly; those which appear to form spontaneously in the air, without the precurrence of either of the above phaenomena. All these may, I think, be explained on the principle of the union of the differently electrified particles of which the clouds are composed.

If a cirrus, after it has ceased to conduct electricity, should receive from either mass of air, between which it may have been conducting, an electric charge, agreeably to the present theory it would loose its cirriform figure, and take on some other, perhaps a cirrocumulus, and by degrees would sink down towards the earth. Under such circumstances, it may come into actual contact with a cumulus rising from below by the upward propagation of diurnal temperature. Such a phaenomenon have I several times witnessed; and the result has been the sudden commixture of both clouds into a denser mass of nimbus, which has resolved itself into a gentle Shower, and all has disappeared; the union of the two clouds thus apparently effecting the destruction of both.

Such Showers, by visible inosculation, are of short duration: the process is soon finished; because the nimbus, thus formed, is circumscribed by dry air, and has no source of supply: and clearness returns, because the superfluous aqueous particles, or such as cannot be retaken into composition by the air, have come to the ground in Rain. When the circumjacent atmosphere has been moist, the process has been different, as described in the next Section

SECTION VIII.

Of Nimbi apparently caused by the interfusion of Moisture between distinct Clouds.

A CUMULUS arising in the lower atmosphere may be electrified differently from a cirrus, or any other cloud occupying a higher region; and these may both subside; the upper one, perhaps, by evaporation; and the lower by the usual vespertine descent, without uniting and forming the compound modifications. This appears to be frequently the case in very dry weather, when cirri may be observed in the higher air, changing their forms, passing to cirrocumulus and cirrostratus, and eventually subsiding, while cumuli sail leisurely along below. And these appearances continue, for many days together, without producing cumulostratus; which, nevertheless, occasionally happens, from the cumulus rising up and meeting with some other cloud descending. This will sometimes produce a nimbus, as I described above. At other times, however, the cumulostratus thus formed proceeds no further, and even reassumes the character of simple cumulus, and subsides

in the wonted way. These are circumstances which by the hygrometer I have observed to attend a dry state of the air,

Previous to Rain, very different appearances frequently present themselves. The cumulus in the lower atmosphere changes its appearance, becomes denser, irregular in shape, and rocklike in its superstructure, with fleecy protuberances about its base; and, by degrees, is a complete cumulostratus. While this process is going on, cirri, cirrostrati, or cirrocumuli, which have previously appeared above, are lost, to all appearance, as if they had suddenly evaporated. The air will now be found damper, and there is frequently a visible mistiness above; and the explanation which I have to offer for this phaenomenon is, that the humidity of the air between the clouds affords a means of communication between their different electricities; and that the cumulus, being the largest body, draws down the cirrus above, and is aggrandized, its previous electric state destroyed, and its structure altered by the change. The surrounding air being damp, the process goes on, affecting clouds more distant, and the result is nimbus and Rain.

A free passage for the electric fluid being

afforded by the humidity of the air, it may readily be imagined that the cumulus below, and the cirrus above, differently electrified, would mutually attract each other; and that the cumulus, being the larger body, would draw down the particles of the cirrus, while it appears to be drawn upward in a proportionate degree, and rises into mountains. The sudden loss of the cirriform cloud above, instead of a visible descent, is not at all surprising; for its electric state being destroyed, and its particles being more powerfully attracted by the greater aggregate, they cease to be held together in a body. This suggests another reason for thinking that it is not the simple attraction of aggregation alone which keeps the particles of clouds together in a mass.

When the cirrus above has been very large, I have observed the process to vary, in a manner quite conformable to my notion of the principles of action of the two clouds on each other. A sort of haziness having appeared between the two clouds, the cirrus loses its cirriform and fibrous figure, increases in density, and swells downward, to meet the cumulus rising from below and also changing its structure, till they have both united and formed a nimbus. The

two clouds in this case being more nearly of a size when the communication of their electricities took place, neither of them drew the other into itself, while both, losing their electric state, went on to become separate nimbi, and united merely upon the principle of attraction by which a nimbus is held compact.'

SECTION IX.

Of what has been called Spontaneous Nimbification.

By what has been said above, it appears that the cause of such a union between two differently electrified strata of cloud, is the humidity of the interjacent atmosphere: and this humidity, it seems, may take place either in consequence of the dispersion of some cloud from a cessation of the electric actions which keep it together in a mass, or by a more general deposition of haze from the oversaturated air. Either of these causes, by affording a communication of electricity between the differently electrified clouds, might cause their union, and the production of nimbus. I think this will explain

the cause of the nimbus unpreceded by other clouds. For if the air, from unknown causes, can so deposit watery particles, which may be diffused through a large mass of air, if the said large tracts of air, before dry, and consequently an electric, should have a plus and minus state, the watery particles diffused in it would also receive such a division of electricity; but these electricities having now, by the general humidity, a communication almost as soon as formed, they might unite, so as to form Rain. This is a process which would be comparatively slow and progressive: and thus we may account for what has been called, by some, the spontaneous formation of nimbi;* and, by others, the gradual condensation of the air into Rain,† which lasts whole days, and affords an example of the more slow and gentle operation of the same causes, which, when effected rapidly by the sudden union of clouds, produce the more temporary and violent phaenomena of showers and thunderstorms.

* M. I. A. De Luc mentions having observed this spontaneous nimbification, unpreceded by cirri, when he was at the top of high mountains. See some curious observations in his “*Idees sur la Meteorologie*,” 2 vol. 8vo. London, 1786.

† In nimbium cogitur aër

SECTION X.

Of certain Effects of the different Modifications on each other, by Approximation, or with Coalescence.

It has been already stated, that the effect of the coalescence of two different modifications, as, for example, of cumulus with cirrus, has been the production of the cumulostratus; and finally nimbus; and also that nimbus has appeared to result from the vicinity of two different modifications, particularly when the interfused air has been damp. I proceed now to speak of more transitory effects produced on clouds by the approximation of others of a different modification. The most remarkable of these is the conversion of cirrus or cirrostratus into cirrocumulus, on the approach of cumulus, or cumulostratus. On the 12th June, 1811, the weather being showery, with clear intervals, while looking out of window at Plaistow, in company with M. Howard, I observed a cirrus scattered about in the East. Cumuli were at the same time flying along in a lower current of air: presently a large cumulus passed apparently

under the aforesaid cirrus, which now seemed affected by the approach of the cumulus, and rapidly took on the form of a sort of stellated cirrocumulus; the cumulus, at the same time, increased in density, and approached more to the nature of cumulostratus. I have several times since seen this phaenomenon effected in the same manner. On the 16th June, 1811, a large mass of cumulostratus passing under long streaks of cirrostratus, the latter gradually, as the former approached, changed into cirrocumulus. For particulars relative to the kind of weather, state of meteorological instruments, &c. see Journal for the above two days in Gent. Mag. for July, 1811. Analogy leads us to refer these phaenomena to the operation of the different electricities of the two clouds on each other. The effect of large masses of cumulus on smaller ones in their vicinity has been otherwise noticed. The approximation of clouds towards each other is always attended with some alteration of their appearance. And clouds are always operating on one another and altering each others' forms.

SECTION XI.

Of Thunderstorms.

THE paper of M. B. P. Van Mons, reprinted in Nicholson's Phil. Jour. Sept. 1809, induced me to observe accurately the two different kinds of lightning therein mentioned. I will not venture to speculate on their causes, referring for them to his paper, but shall proceed to state the difference. One kind is a vivid flash, shortly afterwards followed by a loud clap of thunder, resembling the sound of the discharge of a mortar or cannon. This is found to be the mischievous kind, and is attributed to the discharge of the fluid analogous to the flying off of the electric spark. The other kind, ascribed by M. Van Mons to the combustion of the gases of water, and is not so vivid, but has more lititude of light and is followed by rolling thunder.* These two sorts often alternate in the same Storm. But it is often the case in other Storms that none but the rolling thunder is distinguished. The vespertine fulgurations,

* Two kinds of lightning are mentioned by several ancient writers. Consult Seneca, Nat. Quaes. lib. ii. sc. 16. 20.

called summer lightning, are not followed by any thunder at all.

By a collation of journals, it appears that the occurrence of thunderstorms is often nearly simultaneous in very distant parts of the country, which indicates a disposition to their formation taking place in large tracts of atmosphere at once. But at other times they are very local and detached. Monday, the 29th of July, 1822, I was witness to a very violent storm about 6. P. M. at Gex, by the Lake of Geneva, which returned again with great violence, while I was travelling with Mrs. Forster near Nyon, at 8 o'clock at night. On the 30th still more tremendous Storms of Thunder Lightning and Rain, fell between Lausanne and Vevai, which destroyed all the grapes in the vineyard of M. Huber, of *Belle Air*. By a collation of observations, it appeared that at the same time violent and mischievous Storms occurred in France, all along the Rhine, through Holland, and in England as far as Bridgenorth in Shropshire, and were characterized by their destructive character in all those countries.* For more particulars relative to the electric phaenomena of thunderstorms and nimbi in general, refer to the chapter on Electricity.

* See my Letter in *Philosoph. Mag.* for Sept. 1822.

SECTION XII.

Of Masses of Cloud not to be referred to any of the Modifications.

MASSES of cloud frequently appear, not referable for a time to any of the modifications: but even these, if they last long enough, generally break out into some modification ultimately: when they do not, they must be described in journals as well as they can; but I have seldom seen any, which, if watched long enough, did not show sufficiently the character of some one of the modifications, to be registered under its name.

As I have before observed, it is not always an easy matter to an unexperienced meteorologist to determine to which modification every cloud he sees is to be referred. There are intermediate varieties of cirrus, cirrostratus, and cirrocumulus, which approach so much to the nature of each other that the assignation of a name becomes very difficult. A tendency to the orbicular arrangement, while the nubiculae are kept asunder, is the distinguishishing character of the Sondercloud; but sometimes features ap-

pear which have somewhat of this kind of arrangement, but are yet so light in their texture as to partake almost of the nature of the Wanecloud. In my journals have I called these the cirrocumulative features of cirrostratus. There are many varieties of these indeterminable features: a flimsy cloud of this kind is often seen in the clearer intervals of rainy weather, which gives the idea of the flowers of the cauliflower. The innumerable little round spots of cloud which sometimes cover a great extent of sky at an elevated station are sometimes of this flimsy and almost transparent structure, while at other times they are denser, and therefore more decidedly cirrocumuli. In some kinds of weather, often with Easterly wind and during cold unwholesome air, a cloud is seen covering great part of the sky, which has the thin and transparent texture of cirrostratus; but the component nubeculae have the large and rounded form of cirrocumulus; it seems to differ from the latter cloud in being shallow and flimsy, and from the former in having a rounded circumscription.

Among the sportive and amusing features which are exhibited under other circumstances of atmospheric peculiarities, we have sometimes

long tapering columns, horizontal or inclined, of a cloud composed sometimes of little cirrocumulous nubeculae, and sometimes of those of a sort of cirrostratus like little freckles; or like bundles of small streaks arranged in rows. Mostly these little bunches of cloud are in a plane; but I have thought, though it might be an optical deception, that they have been sometimes in a roundish column, giving a faint resemblance to the tail of an armadillo.

I once saw a column of this sort inclined, curved, apparently pendant from a sort of cirrus, and coloured purple and lake by the setting sun one afternoon in keen March weather.* The cloud which gives what is called the mackerelback sky is composed of the long waving cirrostrative nubeculae, but these sometimes acquire the apparent substance and solid look of cirrocumulus.

In the large and long beds of nubeculae, which frequently float gently over in summer, there is often cirrostratus and cirrocumulus in the same bed: these change from one to another by degrees; and there are intermediate and also confused or plain features in the same flotilla of travelling waters.

* Described under the account of the cirrostratus.

Thus have we seen that though there be intermediate and mixed features, they have a constant resemblance more or less to one or other of them, and a tendency to assume sooner or later some regular form; a circumstance which shows the distinct nature of the modifications, and persuades us that the names have not been imposed at haphazard or on artificial or imaginary distinctions; but that they represent distinct and obvious genera of clouds, of which more attentive observation points out numerous species or subdivisions.

SECTION XIII.

Of the apparent Fragments of Nimbi called Scud.

WE may observe after showers, when the nimbus appears to have spent itself, and the separate modifications reappear in their different stations, that there are loose dark flocky detachments of clouds flying along in the wind, and generally rather low down: these seem like broken fragments of the nimbus; the sailors call them Scud; they often fly along in a lower cur-

rent of wind, at a time when large mountainous cumulostrati and cumuli appear more stationary, somewhat higher up, and when flimsy features of cirrostratus, cirrocumulus, and cirrus are visible in a region still more elevated. When this Scud is abundant we may be sure the imbriferous quality of the atmosphere remains, and we may expect a return of the showers. These fragments differ in general from the flocky and nascent cumuli which feed nimbi from below during Rain, in being of a darker and more nimbiform consistency. I have been at the top of the mountain Cader Idris when they have passed below me through the valleys. They then appeared like a dark purplish mist. But sometimes whitish fleecy cumuli of similar form sail along, and at others more compact cumuli; there being almost all conceivable varieties. These detached clouds are called sometimes by the common people Waterwag-gons, from being observed to supply showers and to indicate their fall.

SECTION XIV.

Of the Mixture of the Modifications.

IN showery and variable weather, when there is much cloud in the sky, we observe often such a mixture of different modifications as must puzzle us to commemorate. Here and there the semiformed shapes of cirrostratus appear in the general mass: in another place irregular cirrus or cirrocumulus; flat sheets seem to drop down into little detached clouds of freckled appearance like cirrocumuli; cumuli are seen under, and milklike whiteness spread aloft in other places. In time the dense continuity of cumulostratus prevails, and the confusion of nimbus and the fall of Rain again take place. To be acquainted with all these different appearances and the different look of different skies, the meteorologist must watch them himself, continually and attentively.

I am desirous of knowing whether in the equatorial and polar climates any great difference in the modifications prevails from those which happen here; from what I can collect from travellers and from drawings, there are few dif-

ferences. The clouds of England, of the northern part of France, and of Wales, are much the same as those of other parts of Europe. I must mention that during my stay in Wales I did not see any decided cirrocumulus; neither did I observe very distinct features of this cloud in the mountainous and highland parts of Scotland, nor in Switzerland and Savoy; but this must have been accident; the cloud is found no doubt in all parts of Europe, and in all parts probably of the world. Indeed I feel little doubt but that, with some few variations, all our clouds prevail everywhere. Accurate journals of them kept in different parts of the world and communicated in the periodical journals would be very interesting.*

* I subjoin an extract from my Journal of a Tour in the Low Countries, in 1819.

Oct. 2d. 1819.—Passing along to-day through Ardres, from Calais to St. Omer, I noticed *Apargia Autumnalis* and *Papaver Rhæas* in blow in the fields. The *Cichorium Intybus* was also abundant near the coast.

The trees in this part of the country, as in nearly all Flanders, are generally planted in straight rows, on each side the road. They are likewise thus disposed in the fields. I noticed that the Ash, Elm, and Beech trees rose with more smooth and longer trunks than the same trees do in England. They are likewise more naked of foliage till nearer to the

SECTION XV.

Of Rain, Snow, Sleet, and Hail.

I HAVE little to say of these four modes of the resolution of the nimbus, which has not

top of the tree. I have noticed this circumstance before in France, and also in Scotland, where walks planted with rows of trees near the towns are equally common as on the continent. I think, therefore, that the manner of disposing the trees together in rows may be partly the cause of this difference. *Agaricus fascicularis* is springing up by the road side.

3d.—Proceeding from St. Omer to Cassel, and thence through Balleul and Armentiere to Lille, I observed the same circumstance of luxuriant and tall trees with very naked trunks. The country was rich, the stubble entirely removed from the corn land, and the meadows very verdant. A great quantity of Stonecrop grew along the top ridges of the barns. In general Lichens and Mosses are less frequent here than in England. The buildings in Flanders are generally large, and either slated or thatched, very old, and often with zigzag gable ends towards the street; but, owing probably to the greater dryness of the air, they do not so readily become covered with moss. It is only here and there that one sees the tiled roof so richly yellow with Lichen and Moss as is very common in England. The Martins were still numerous. The weather rainy and warm.

4th.—Passing onward to Tournay, Ath, and Enghien, I observed very few things remaining in flower, except the

not been already treated of by meteorologists,* nor of their compound, commonly called Sleet.

* Vid. Seneca Nat. Quæst.—Aristot. Meteor.—Des Cartes Treat. Meteor. &c.

Apargia autumnalis and a few Dandelions (*L. Taraxicum*). The country was more open and less planted hereabouts. We slept at Enghien; and in walking in the park and garden the next morning, I saw nothing in blow but a few roses and marigolds. The leaves were turned yellow and falling, and in a much more autumnal state than in France and England.

5th.—Gentle showers, with fair intervals. The country became more wooded again with Ashes and Beeches in rows as we passed through Halle to Bruxelles. The atmosphere is certainly more transparent than in the Eastern part of England: we saw the lofty spires of the Hotel de Ville of Bruxelles, and other high buildings, at a great distance.

The *Aster Chinensis*, *A. Tradescanti*, and Marigolds, are most cultivated, and are now in blow in Belgium. The Aspen Trees and Poplars are less common here than in French Flanders. The rows are seldom composed for long together of Lombardy Poplars, though I saw some of prodigious growth, considering they were first introduced into this side the Alps only about sixty years ago. The limes are not so fine as in Kent, Sussex, and Surry.

6th.—The road to Mechlin is uninteresting in a botanical point of view, being by the side of a canal made for the treckschuyts and barges. The marsh groundsel was the only flower I saw.

7th.—Weather again rainy. At Antwerp I noticed abundance of *Agaricus campestris*. I likewise saw the *Boletus*

The peculiarities of Rain seem principally to consist in the size, and close or distant arrange-

edulis vended in the markets as an article of food. I made few observations on Natural History here, being taken up with the numerous antiquities and pictures with which this town abounds; but one thing I noticed (which shows the greater dampness of English air even compared with Dutch marshes), was, that the bells in the tower of the cathedral, and even those of the carillon, which are exposed in the open part of the steeple, were free from rust, though bells of much more recent date in England become quite green with it.

At the *Tête de la Flandre*, on the West side of the Scheldt, they keep the Yellow Wagtail (*Motacilla flava*) domesticated in the rooms to catch the flies, which are very troublesome.

In the marshes East of Antwerp, and in Holland, grows the *Senecio paludosus*.

8th.—About Lookeren the country is marshy and flat, and abounds with windmills; but they are not so plentiful here as at Lille, where several hundred mills are employed to drain the suburbs of that city.

Near Courtray, where we slept, *Papaver Rhæas* begins again to be common; the road about Ghent, and all the way to Courtray, is lined with trees, and the country much enclosed. About Ghent I also noticed Oaks and a sandy soil.

9th.—At Ypres:—The Martins (*H. urbana*) very numerous, and evidently congregating to depart.

10th.—Weather fine and warm; we passed last night at Dunkerque. The POMONA seems very luxuriant this year throughout Flanders, particularly in Pears and Grapes.

In crossing the channel this evening from Calais to Dover,

ment of its streams. I have observed, that the large and distant streams of some summer showers have often a strong positive electricity. Rain has been found sometimes positively, and at others negatively, electrified; and sometimes nonelectric.

The peculiarities of Snow seem to consist, for the most part, in the size and shape of the flakes. Sometimes they are of a sort of stelliform figure. Hailstones vary in size and shape. Such large ones sometimes fall, as break windows, and do other mischief. Of this a memorable instance happened some years ago at Bruxelles. I think I remember to have found some round and transparent Hailstones which contained opaque concentric globes in the inside. Hail and Snow have generally been found electrified.*

* Consult the experiments of Cavallo, *Comp. Treat. Elect.* —Bertholon. *Elec. Met. &c.* See Chapter on Electricity of Clouds.

the captain noticed to me the quantity of gossamer on the rigging of the vessel, which he said was a sure sign of fine weather.

On the 11th and 12th I noticed this web so abundant all the way through Kent, by Canterbury and Maidstone, to Hartfield, that the fields were quite white with it.

SECTION XVI.

Of the Colours exhibited by Clouds.

IT is an unfortunate circumstance, that there are no words in common use for colours, in any known language, which are sufficiently explanatory. This circumstance arises probably from the great variety of shades and combinations of colours which flowers and other natural and artificial productions every where display.

Clouds, as is well known, refract and reflect a great variety of beautiful tints, the shades of which vary according to their relative position with respect to the sun; but the colour seems also to depend on the kind of cloud, and the degree of its density. The Wanecloud shows the most beautiful and varied colours. Different shades of purple, crimson, lake, and scarlet, are the most common. The haze, with a horizontal sun, refracts different colours at different times; yellow, orange, more or less of a golden hue, red, and lake, are the most common; sometimes I have seen the haze refract a brownish colour. The colour varies upwards; sometimes I have seen several colours in the haze. Particulars of

which may be found in my Journal in Phil. Mag. The colour of clouds should always be noted down in meteorological journals, as also the particular modification in which the colours appear. I have noticed that cirri, cirrocumuli, &c. at different times show different colours, though in nearly the same situation with respect to the sun.*

I have often seen the nubeculae of cirrocumulus forming in beds here and there, about the time of sunset, highly tinged with crimson, or with vermillion; colours which more often affect the cirrostratus and not unfrequently the cirrus.

There is one curious circumstance worthy of notice with respect to the refraction of colour in clouds. We often notice the light clouds, cirrostrati for example, which show fine colours just above the set sun and near to the horizon

* A systematic arrangement of colours might be made as well as of scents, by reference to flowers, and other standard substances. It would be well if we had a nomenclature for colours, which expressed them by reference to the proportion of the primitive tints of which they may be compounds. In the year 1813 I published several papers on the nomenclature and etymology of names for colours. See Phil. Magazine, vol. xlii. pp. 119 and 327.

at a time when they either do not appear at all over head, or do not there refract any colours. If it were only from one place that these clouds were seen near the Western horizon, we might suppose that they were local, but as all over large tracts of country the same appearances would be seen probably at the same time, we must conclude that the modification of cloud is existing every where about, but that a particular angle with respect to the sun is necessary to its being visible, or appearing as a coloured cloud.

We observe that clouds of the same variety, having the same local or angular position with respect to the sun, sometimes appear richly coloured, and at other times scarcely coloured at all; a circumstance which renders it questionable, whether the colour is from the cloud itself, or whether the cloud only reflects the light which is coloured by refraction in passing through the haze of the atmosphere in the evening?*

* Another very curious phenomenon, which I cannot help ascribing to some peculiar atmospheric refraction is the alternation of colours observable in certain of the fixed Stars, particularly Antares, Betalgeus, and other red Stars. I first observed this phenomenon in 1809, in September; in the twinkling of the Star the colour changed, so that one twinkle

former is however probably the case; for different clouds in nearly the same angular position with respect to the sun show different colours at the same time. But the colours refracted by the haze are very various. Sometimes the tints in the twilight haze come on so suddenly and are so circumscribed as to induce a belief that very sudden and partial changes take place in the atmosphere at eventide; which may perhaps be somehow connected with the formation of Dew. It is doubtless the falling Dew which refracts the colours in general, which are varied by the position of the parts in which they are

or fit of dilation and brightness of the Star seemed whitish, and the next or alternating twinkling seemed red. I have elsewhere described this appearance more minutely, and have attributed it to some wavy motion in the upper part of our atmosphere, whereby, being imperfectly prismatic, it produced different colours according to the relative inclination of the undulating surface. At other times I have thought it might arise from some change in the Star itself; but the former proposition is much more probable; and what corroborates the idea that it is atmospheric, is that it is not always equally conspicuous on all kinds of nights. I should like to know how the East wind affects this phenomenon, as when the wind is from that quarter, celestial objects seem to dance about so in the field of the telescope, that no good observations can be made.—Refer to *Phil. Magazine* for 1817, vol. xlix. p. 453, and to the *Monthly Mag.* for Jan. 1823, vol. liv. 486.

seen. There is frequently a deep golden orange close to the horizon, a crimson blush above it fading into purple and the dark blue, about it on each side a whitish transparent appearance, or a lively greenish blue; or perhaps the true light prismatic blue; and all these vary as the sun gets lower beneath the horizon.

A remarkable instance of the sudden change in the colour of the clouds happened on Saturday, the 2d of the present November, 1822. Being, about four o'clock in the evening, near Croydon in Surry, I observed a very beautiful Western Sky, caused by the bright edge and dependent fringes of a light bed of cloud being finely gilded by the setting sun. Some detached cirrocumuli also, which formed the exterior boundaries of the aforesaid cloud, were likewise of a fine golden yellow, and the same colour appeared in different clouds in other parts of the sky, while the scudlike remains of nimbus floated along in the West wind below. In the course of about a quarter of an hour the lofty gilded clouds all assumed a deep red appearance, and the change was effected so suddenly, that while looking at them I only took my eyes off them for a minute, to stop down the tobacco in a pipe that I was smoking,

and when I looked up at them again, the colour was totally changed. Now what renders this phenomenon remarkable, is that it happened just about the period of the Vapour Point. The descending sun had scarcely had time to make any great difference in the angle of reflection, and it seemed, therefore, that some sudden change produced by the first falling Dew was the cause of this simultaneous change of colour in all the clouds then visible. On the morning of Friday, the 22d of November, I observed the counterpart of this phenomenon, namely the sudden change of a bed of Wanecloud; the sky itself looking very green at the time, from a beautiful red at 10 minutes past 7 o'clock, to a bright golden yellow at 20 minutes past 7. This change seemed effected by the getting higher of the sun.—Wind and Rain followed.

These and numerous other beautiful appearances of diverging streaks, bars, and spots, may often be seen with a horizontal sun; we notice them chiefly in an evening, because we seldom rise soon enough in the morning; but they may be observed to display nearly the same degree of beauty, though with some variety of appearance, when they usher forth the gay Aurora, rising from the bed of the sable Tithonus, as when they

throw their painted canopy over the declining car of Phoebus, and mark the place where he has sunk beneath the Ocean, till they fade away by degrees, and are lost in the uniform gloom of Night.

SECTION XVII.

Of the Height of Clouds.

THE mean or average degree of elevation of the different modifications is different. According to M. Howard, the cirrus is the highest; the cirrocumulus next; and the cirrostratus, cumulus, and stratus, successively lower than each other. The cumulostratus, which is a compound cloud, is of vast vertical dimensions: when it forms on a cumulus, the top of it appears to rise higher, and the base generally lower, than that of the cumulus. The nimbus, which is the resolution of clouds into Rain, may be considered as having its base on the earth, and its summit at the end of the fibres of its cirrose crown.

The modifications have different degrees of elevation at different times; and sometimes the

order of them is inverted: many instances of which may be found by consulting journals. I have seen the cirrus in tufts moving along rapidly in the wind, below cirrocumulus, and even cumulus in a higher region. Towards evening on Sunday, April 12, 1812, I observed from Clapton a small fibrous cirrus moving rapidly along in the wind, lower than fleecy cirrocumulus which appeared in a comparatively calm region above. There were, however, other cirri more elevated in the sky at the same time. The following spring, on Sunday, the 21st March, 1813, at Cambridge, about 11 A. M., I remarked a long cirrus moving rapidly along in a North wind, not lengthways, but abreast. At one end of it fibres pointed backward to the North, while at the other they pointed to the East. Higher up, light cumuli passed over from the South; and higher still were flimsy ill defined masses of cirrocumulative cirrostratus in an air comparatively calm, but they were found to be passing over gently from North West. Many other cases of inverted order might be noticed. Sometimes cirrocumulus may be seen under a spreading sheet of cirrus of a milky appearance, which looks like a bas relief. I have once or twice noticed the nubeculae of

a bed of cirrocumuli lower down to be smaller than those of one more elevated. This was noticed among the abundance of cirrocumulus, cirrus, and other clouds, which appeared on 21st Oct. 1811: the night succeeding was cloudy, with a gale from South and distant lightning. The long lines of cirrus extending across the sky have been found to be very high, by geographical observation. By the same mode of mensuration, I found that I was frequently much deceived in my opinion as to the height of clouds at first view of them. Saussure writes of the very great height of clouds, which from the description must be a kind of cirrostratus in mottled beds, and Dalton mentions, that the clouds of the Mackerelback Sky, as he calls it, have appeared almost as distant from the top of high mountains, as from the ground.* That clouds are sometimes very high, there can be no doubt: and their height may be easily taken with quadrants at different stations. Aëronauts have generally ascended much beyond the cumuli; but I question if there be not clouds much higher up than any balloons have ever ascended. M. Sadler

* Dalton's Meteorological Essays.

mentioned to me, that large cumuli seen by him, when at a much greater elevation in a balloon, appeared like small silvery specks on the ground; his distance from them being so great, that they appeared to rest on the earth's surface; but I have found no accurate accounts of Aëronauts having ascended so far aloft as the lighter modifications sometimes appear to be elevated.*

Those who have been on the tops of high hills and mountains, have frequently spoken of clouds having passed below them; but being unacquainted with the peculiarities of clouds, and having been inattentive in their observations, their accounts have been of little value for ascertaining the general height of the modifications; when I was at the top of Cader Idris, on Sunday evening, August 14, 1814, the weather being cleared up after a showery morning, I noticed that the Scud passed above and below the tops of the mountains, but the bases of most of the cumuli were above them; a long bed of Curlcoud with fine fibrous edges was much higher, so that my ascent up the moun-

* The highest aëronautical ascent seems to have been made by M. M. Bertrand and Morveau from Dijon in Burgundy.

tain hardly seemed to bring me nearer to it; but the most exalted clouds of all were the flimsy cirrocumulative forms of cirrostratus. Indeed it may often be observed that these transient features of cirrostratus, which appear in the intervals of Storms, are elevated much above the tops of cumulostratus, or cumulus, which may be seen lower down. Future observations by means of trigonometrical measurement may, when the differences of clouds become more generally known, lead to a more accurate estimate of the height of the different varieties. In general, the regular ephemeral cumuli have much the same elevation, which somewhat increases during the day from the rising of the Vapour Plane whereon they float. I have made observations with a view to determine whether cumuli were not usually higher over some soils than over others, but I cannot perceive much difference in this respect; they certainly have appeared somewhat lower when over the sea, than when they have come over the land; I noticed this at Hastings, in August and September of the year 1814. Before Rain they descend lower, increase irregularly in size, and are condensed into cumulostratus. I have noticed that when

cumuli, which were flying along in the wind, have by any accidental inosculation of the clouds, or from any other cause, changed to cumulostratus : the change has been uniformly attended with a retardation of the motion of the cloud. This probably arises from its having been increased in density in proportion to the surface presented to the wind.

SECTION XVIII.

Of the Structure and Buoyancy of Clouds.

THE first step towards a perfect knowledge of any science, is to have an accurate and well arranged detail of particular appearances. From effects thus laid out in order, we proceed to examine what may have been their causes. It may be proper now to examine, whether the particles of clouds remain afloat in the air, or only gravitate very slowly to the ground? In other words, on what peculiarity of structure does their comparative levity depend? Experience being deficient, conjecture supplies its place, and supposes an adequate cause.

M. de Luc, and M. de Saussure, have sup-

posed that they may be composed of hollow vesicles;* and, in this case, if the component vesicles should contain an aëriform fluid, lighter than common air, they would become buoyant, and float in the atmosphere. It is not probable that they contain hydrogen gas. For, if they do, what can be the structure and component parts of the vesicular bag itself? It cannot be water. For, if electricity should preserve it in the vesicular form, it could not prevent the escape of its hydrogen from within. Could the bag itself be water, it would never be oxygen and hydrogen in a state of combination. The oxygen would not affect or act upon the hydrogen in the bag, because it had already combined with its due proportion of hydrogen, and become water. Nothing, then, but an accession of more oxygen could convert the contents of these vesicles into water. When the electricity is equalized, the water which composes the bag or vesicle comes down in Rain; and the hydrogen, mixing with common air, may be exploded by the electric spark, or, meeting with oxygen, may explode sponta-

* *Idées sur la Meteorologie*, par I. A. de Luc, vol. ii. p. 607. part iii. sect. vi. p. 100.

neously, and produce one kind of lightning and thunder. This is, however, only vague conjecture: nothing is certainly known about the structure of clouds. It would make a very good theory, with the solution of the following questions. 1st. What are the circumstances under which hydrogen could be contained in a vesicle of water? And, 2dly. What can occasion such a separation of the gases on a condensation of vapour into cloud? In short the opinions entertained about vesicular vapour seem in general to have been vague and ill-founded. That the structure of different clouds is very different, is manifest from their different refracting and reflecting powers, producing the various appearances of the Halo, Corona, Parhelion, &c. on different occasions, as well as from the very different appearance of the clouds themselves.

But there is, in fact, no proof that the particles of water have any specific levity in the air; they may, perhaps, only gravitate very slowly to the earth, from their minuteness, as soon as from any cause the elastic vapour is condensed into a visible cloud. The manner in which such aggregates may constitute a visible and floating cloud, which preserves or

increases its elevation, has been explained by M. Howard in his account of the Vapour Plane, and the cause of the Stackencloud.*

SECTION XIX.

Of certain Luminous Appearances which result from the Reflection and Refraction of Light by Clouds, and which are commonly called Halos, Rainbows, Parhelia, and Paraselenas.

EVERY one who is conversant in meteorology must be well acquainted with such luminous appearances, occasionally seen about the sun, moon, and planets, and caused by the refraction of their light through a cloud of peculiar structure, as are usually called Halos, Coronae, Burrs, Glories, &c. But these phaenomena have hitherto received no definite names whereby they may be distinguished from each other, though they differ considerably in appearance. Meteorologists have spoken of Halos and Crowns of light indiscriminately, without distinguishing between the Corona or luminous disk, and the Halo or luminous ring.

* Howard on Clouds, in Phil. Mag.

The ancient writers, too, spoke indifferently of halones, circuli, coronae, halyses, parhelia, and other the like phaenomena, as appears by the works of Aristotle,* Pliny,† Seneca,‡ and others. Aristotle appears to have written with the most perspicuity of all of them.

With a view to obviate the inconvenience and misunderstanding which might arise from the confusion or promiscuous use of terms not sufficiently definite, I subjoin the following classification, which, though imperfect, may serve, till a better shall be found, to enable meteorologists, in their journals, to express, with tolerable precision, the kind of appearance which they wish to commemorate.

I endeavour to classify them (for want of a better criterion) according to the apparent *shapes* or *figures* which they present. It must be remembered, that their various figures are the result of the particular construction of the cloud which refracts their light: a correct attention, therefore, to these appearances, may lead to a more perfect knowledge of the structure of the refracting medium.

* Aristot. Meteor. lib. iii. cc. 2, 3.

† Plin. Hist. Nat. lib. ii. cc. 29, 30, 31, 32. lib. xviii. 35.

‡ Senec. Nat. Quaest. lib. i. cc. 2, 3, 4, 5, 6, 7.

HALO.* Pl. VI. Fig. 1. *Circulus vel Annulus lucidus aream includens, in cujus centro Sol aut Luna apparet.*

By a Halo I understand an extensive luminous ring, including a circular area, in the centre of which the sun or moon appears; whose light, passing through the intervening cloud, gives rise to the phenomenon. Halones are called *Lunar* or *Solar*, according as they appear round the moon or sun. Those about the moon are the most common. They are generally pretty correct circles: I once, however, saw a Halo of a somewhat oval figure. Halones are sometimes coloured with the tints of the rainbow.*

HALO DUPLEX, Pl. VI. Fig. 2. *Duo Anuli, in quorum centro communi Sol aut Luna videatur.*

A double Halo is not a very common occurrence. I have observed, that simple Halones

* The word *Halo*, or *Halos*, is evidently derived from the Greek ἅλων or ἅλως signifying an *area*. The Latin writers appear to have spoken indifferently of halones, halyses, coronae, circuli, &c. without sufficiently distinguishing between the *Corona* and the *Halo*.

* The coloured Halo is generally seen in a denser kind of cirrostratus.

are generally about 45° in diameter: in case of double Halo, it might be worth while to take the diameters of each of the concentric circles.

HALO TRIPLEX. *Tres Annuli, in quorum centro communi Sol aut Luna appareat.*

Triple Halones are extremely rare occurrences.

HALO DISCOIDES. Pl. VI. Fig. 3. *Annulus aream reliquâ nubis parte lucidiorem continens, in cujus centro Luna aut Sol visus est.*

A discoid Halo may be said to be a Halo constituting the boundary of a large Corona: it is generally of less diameter than usual, and often coloured with the tints of the Iris. A beautiful one appeared at Clapton on the 22d of December, 1809, about midnight, during the passage of a Wanecloud before the moon.

CORONA. Pl. VI. Fig. 4. *Discus lucidus, vel portio circularis nubis reliquâ lucidior, in cujus centro Sol aut Luna videtur*

When the sun or moon is seen through a thin cloud, a portion of the cloud, more immediately round the sun or moon, appears much lighter than the rest of it: this luminous disk, if I may be allowed the expression, I call a *Corona*.

Coronae are of various sizes, according to the peculiarities of the intervening vapour: but they seldom exceed 10° in diameter: they are generally faintly coloured at their edges.

Frequently, when there is a Halo encircling the moon, there is a small Corona more immediately round it. Coronae, as well as Halones, have been always observed to prognosticate Rain, Hail, or Snow. As far as I can observe they are generally seen in the cirrostratus cloud.

CORONA DUPLEX. *Discus lucidus, alium discum paulo lucidiorem ac minorem includens, in quorum centro communi Sol vel Luna videtur.*

A double Corona is very common: sometimes they are triple or quadruple.

PARHELION. Pl. VI. Fig. 5. *Imago Solis falsa, vel plures imagines ejusdem generis circa Solem circulatim dispositae, et magis minusve halonibus aliisque lucidis vittis committatae.*

Parhelia vary considerably in general appearance: sometimes the sun is encircled by a large Halo, in the circumference of which the Mock Suns usually appear: these have often small Halones round them: they have usually a horizontal band of white light of a pyramidal

figure extending from them : sometimes a large semicircular band of light, like an inverted arch, seems to rest upon the Halo which encircles the sun : but these phaenomena vary too much to be particularly described here : their peculiarities ought to be minutely observed and noted down in a Meteorological Journal.

PARASELENE, *Lunae imago falsa, vel plures imagines hujus generis circa Lunam dispositae, et magis minusve halonibus aliisque lucidis vittis committatae.*

The *Parasclene*, the *Parhelion*, and the several kinds of *Halo* and *Corona*, all appear to result from the intervention of cloud between the spectator and the sun or moon, through which the light passes : but there is another well known phaenomenon, which always appears in a cloud opposite to the sun or moon ; namely, the

IRIS. *Circulus maximus coloratus in nube Soli oppositâ visus, et cujus centrum centro Solis opponitur, qui, quòd portio ejus tantùm videtur, arcus adparet.*

The Rainbow is an appearance too familiar to every one to need any particular description. As the Halo and Corona appear generally in the Waneccloud ; so the Iris appears always

in the Raincloud. Lunar Rainbows are rare occurrences.

IRIS DVPLEX. *Duo Circuli colorati, quorum centrum commune Solis centro opponitur, qui quòd eorum portiones tantum videantur Arcus adpareant.*

Double Rainbows are not unfrequent. The order of colours in the outer one is reversed.* They are mentioned by Aratus.†

IRIS VNICOLOR. *Circulus maximus colorum excors, in nube visus, et cujus centrum centro Solis vel Lunae opponitur; qui quod portio ejus tantum videatur Arcus adpareat.*

The Iris unicolor is more properly a colourless Rainbow, and appears in the mist. Such a one appeared on 20th November, 1812, in the vicinity of London. The afternoon of the same day there was a shower in which the Rainbow showed the usual colours.‡

RADI DIVERGENTES. *Radii Solis radiantes ob quandam specialis generis interpositam nubem.*

The remarkable appearance of the sun's rays,

* Arist. Meteor. lib. iii. cap. 5. Newton's Opticks, &c.

† Arat. Dios. 208.

‡ Annals. of Philosop. by Dr. Thomson, p. 80.

in a cloud before Rain, has been alluded to by Aristotle,* Virgil,† and others.

RABDVS PYRAMIDALIS. *Portio pyramidalis lucis in nube visa, quasi ex Sole procedens, cujus vertex diametro Solis horizontali perpendicularis est.*

Not uncommon in haze of a peculiar kind, perhaps cirrostratus. Sometimes small portions of the Rainbow's colours appear in different places. I observed this between seven and eight o'clock, 21st August, 1812, while riding between Ticehurst and Wadhurst, in the neighbourhood of Tunbridge Wells; and a similar phenomenon is recorded as seen at Walthamstow, March 24, 1785.‡

SECTION XX.

Of the causes of the abovedescribed Phaenomena.

IN examining what may be the causes of the various phaenomena above described, I make a

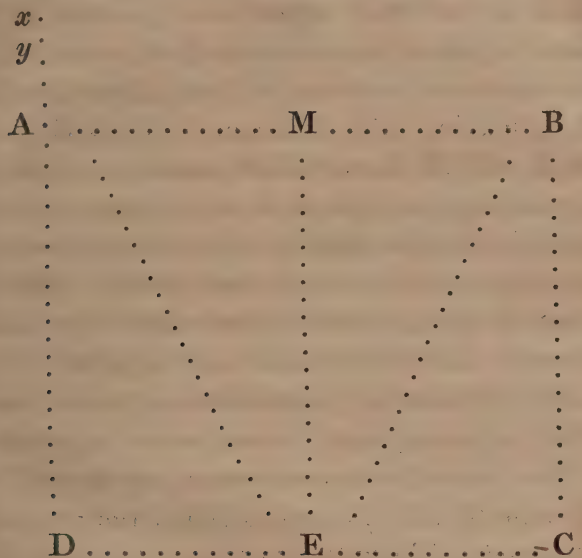
* Arist. Meteor. lib. iii. cap. 2.

† Virgil Georg. lib. i. v. 445.

‡ Noted in a Journal kept by E. Forster, Esq. from Jan. 1785 to April 1812 inclusive.

division of them into—1st, those which result from the intervention of cloud between the spectator and the luminous body. And, 2dly, those which appear in a cloud opposite to the rays of the sun or moon. Of the 1st sort are all the different kinds of Halo, Corona, and Parhelion. Of the 2d sort are the different varieties of the Iris. With regard to the first kind of these, caused by intervention of clouds, many attempts have been made by different philosophers to explain them; but they have been generally founded more on vague conjecture than fact. All that can be said about them is, that they probably depend upon some peculiarity in the refractive or reflective powers of the intervening cloud, by which certain of the rays are thrown off at a particular angle. I may, in the first place, observe, that all the rays from the sun or moon must fall nearly parallel on the surface of the cloud. This will be evident, if we consider the great distance of those bodies when compared with the diameter of the largest Halo. The rays which constitute the luminous ring of the Halo, must be reflected at an angle equal to the angle of the semidiameter of its area; or, in other words, to the angle subtended by the distance from the sun or moon's centre

to the ring. To illustrate this, I subjoin the following problem and figure.



The distance of the sun or moon from the cloud bears so great a proportion to the diameter of the Halo, that the rays may be said to fall physically parallel on all parts of it; that is, if of two rays coming from the sun's centre, one should impinge on A, and the other on B, these rays might be considered as parallel. Let A B be the diameter of the Halo, M. the centre or place where the moon *appears*: if a ray, $x y$, proceeding from the moon in the direction $x y$,

and impinging on A, should pass through the cloud in a straight line, that is, perpendicular to A B, it would appear to a spectator at D. But it appears to a spectator at E; therefore it diverges from the straight line A D in the line A E, making with it an angle D A E; join M A and M E, and E D, making A D E M a parallelogram, and A E its diagonal. Then (Euc. i. 29.) the angle D A E, or angle of the aberration of the ray, is equal to the alternate angle A E M, or angle under which the semi-diameter A M of the Halo A B appears.

From the above, it appears then, that a Halo of 48° diameter may be ascribed to a property in the cloud of refracting certain of the rays at an angle of 24° . A double Halo, the exterior ring whereof includes an area of 48° , and the interior ring whereof includes one of 10° , must be attributed to a property in the cloud of refracting certain of the rays at an angle of 24° , and certain other rays at an angle of 5° , and so on of triple ones.

A Corona of 10° diameter appears to be the consequence of a property in the cloud to refract certain of the rays at every angle, from the smallest, say an angle of $1''$ to 5° , beyond which the rays are refracted in the cloud, in the usual

manner. A double Corona, the inner one of which is 5° diameter, and the outer 10° , is referrible to a property in the cloud of refracting certain of the rays at every angle, from $1''$ to $2^\circ 30'$, and certain other rays, from $2^\circ 30'$ to 5° , and so on of triple ones.*

For further particulars relative to these phaenomena, I refer the reader to the works of Aristotle,† Newton,‡ Huygens,|| Des Cartes,§ M. Helvetius,¶ and to several papers in the Philosophical Transactions** and Manchester's Memoires.†† For explanation of the phaenomena of the Rainbow, consult Newton's Opticks.

By the problem above it appears, that no two persons standing at any distance from each

* Even the breadth of the ring of a Halo itself must be caused by a number of rays, refracted at somewhat different angles; otherwise the breadth of the ring would equal only the breadth of one ray.

† Aristot. Meteor. lib. iii. cc. 3, 4, 5, 6.

‡ Newton, Optic. 1st edit. 2d book, pp. 48. 134.

|| Huygens's Post. Works, pp. 293.

§ Des Cartes. Treatise of Meteors.

¶ M. Helvetius. End of Mercurius in Sole.

** Phil. Trans. vol. v. 1065. xxii. 535. xxxi. 212. xxxix. 218. xlvi. 196. lii. 3.

†† Manchest. Mem. vol iii.

other, and looking at a Halo, see the same light: but as the Halo is seen for a great extent around by persons in different places, a disposition to such reflexion or refraction of the rays is inferred as existing in large and extensive masses of the same cloud. It may be a fit subject of inquiry,—At what distances is Halo seen at the same time? Sometimes the cloud seems very partial, but at others very extensive. When a Halo appears in a cloud, the extremities of which can be seen, it may serve to mark that cloud as a subject of geometrical observation at several distant stations, whereby its distance and magnitude may be nearly ascertained.

In some parts of America, Halos are said to be still more common than in England.

SECTION XXI.

Of the Evaporation of Water.

ACCORDING to the most recent theory, the following will be the process of evaporation. The accession of diurnal temperature communicating to the water the power of calorific

repulsion, the production of elastic vapour, or gas, is the consequence; which, exerting its elastic force by the repulsive power of its particles, rises into the atmosphere; but when a fluid becomes an elastic body, there is a loss of heat of temperature by expansion: and the vapour, therefore, becomes cooler than the water from which it evaporated, and also cools as it expands on its progress, causing the upper air to be cooler into which it ascends; for it has changed its heat of temperature for heat of capacity;* so that the actual temperature of the air is diminished upwards: while the said gas, possessing heat of capacity, is thus enabled to remain an expanded elastic fluid; and it is only by an actual loss of heat, from the nocturnal interception of the sun's rays, that the whole mass of atmosphere, being cooler, is then again condensed into aqueous particles, and falls in dew; by which process the heat of capacity is again changed for the heat of temperature; and the reformation of water in the form of mist or cloud, actually increases the thermometric warmth, in falling; and thus

* I adopt the mode of expression of Sir H. Davy. See him in his *Elem. of Chem. Phil.* vol. i. part i. v. 1, 2, 3, &c.

contributes to equalize the vespertine with the diurnal temperature, and to make the change more gradual. The formation of clouds may be regarded as dependent on circumstances which attend this process; for the rising of the elastic vapour impels that above into an atmosphere already too cold for its solution, which, therefore becomes cloud, as explained before.

As the particles of a cloud, for example a cumulus, are not believed to be kept separate by the same power of repulsion as those of elastic vapour, and as clouds are electrified, so we ascribe the mutual repulsion of their corporeal particles to that of similarly electrified bodies: now, according to Newton, where repulsion ends, there attraction begins; and if by the joint influence of these two powers, the cumulus is kept together as an aggregate, while its particles do not unite, so as to form water, we must suppose that the same principle holds good with respect to electrical attraction and repulsion. After all, these are merely theories, against which there appear as many reasons as there are for them. The inquisitive mind of man is always seeking for causes, and making systems, by which even the most incredulous

are liable to be misled, and to mistake imagination for truth; while the only resource of the philosopher is to arm himself with their mutual contradictions and common want of evidence, and, retracing the steps of his wandering, to sneak back into the plain regions of simple observation, and content himself to behold the variety and order of phaenomena.*

* Dew is vapour condensed into visible drops. Under whatever circumstances of diminished barometrical pressure or decreased heat the air cannot hold so much water in solution as before, the result must be a deposition of it in aqueous particles; during day and under some other circumstances of electricity, definite and floating clouds are the result, and the processes of Rain often commence; but in fine weather, in the evening, the Vapour Plane being destroyed, and the nubific principle ceasing to act, the vapour so deposited comes down in Dew. The Dew is not the result always of the stratus, and it differs from the wet mist of the cirrostrativeness of the lower atmosphere. The circumstances under which Dew is most plentifully formed being treated of by Dr. Wells, in his Essay on Dew, I refer the reader to that publication, and also to Bertholon's Elect. Met.

CHAPTER III.

OF CERTAIN ACCENSIONS WHICH APPEAR TO
TAKE PLACE SPONTANEOUSLY IN THE ATMOS-
SPHERE, CALLED FALLING STARS, METEORS, &c.

THE igneous Meteors which occasionally take place in the atmosphere, have been noticed by most of the ancient writers on natural philosophy with which we are acquainted, as may be found by the works of Aristotle,* Pliny,† Virgil,‡ Lucretius,|| Seneca,§ and others. But the peculiarities remarkable in the different kinds of them do not appear to have been duly noticed. The most minute differences between them ought to be commemorated, together with their relation to other coexisting phaenomena: for in investigating the causes of these luminous accensions, we shall probably be assisted by

* Arist. Meteor. lib. i. c. 4.

† Plin. H. N. Lib. ii. cc. 4. 25. 36.

‡ Virg. Georg. lib. i. 365.

|| Lucret. de Rer. Nat. lib. ii. 206. lib. v. 1190.

§ Senec. Nat. Quaest. lib. i. c. 14.

observing and noting down accurately the peculiarities remarkable in the different kinds of Meteors which from time to time appear. The very large sort, which occasionally are seen; such, for example, as that memorable Meteor seen on Monday, 18th August, 1783, that which took place on Sunday, 13th November, 1803, or the large one recently observed at Geneva,* are not numerous enough to admit of being arranged under any general description; besides which, there are peculiarities in all of the larger sort, whereby each differs from every other. But the smaller kind, which appear in common, seem to me to be referable to three principal varieties, which appear to derive their particular character from the kind of weather in which they happen.

The most common sort are those very small Meteors which are prevalent in clear frosty

* See Nicholson's Journal, 1811.

The falling stars have generally been regarded as foreboders of wind: so Seneca in Hippolyto:

*“Ocyor cursum rapiente flamma
Stella cum ventis agitata longos
Porrigit ignes..*

I have noticed this indication of wind particularly from the caudate Meteors still to be described.

winter nights, and in summer also, when there are dry Easterly winds with a clear sky. They have very much of the appearance of the real stars, and have probably, from this circumstance, derived their vulgar name: they leave little or no train behind them, and shoot along in straight lines, generally obliquely downward, but sometimes horizontally.*

The second kind are larger and more brilliant, and generally appear in warm summer evenings, particularly when cirrocumulus, cirrostratus, and electric clouds abound: some of them are very beautiful, and give much light: they vary somewhat in colour and size. They have sometimes a curvilinear motion.

The third sort are strikingly different from the two abovementioned: they are generally small, and of a beautiful bluishwhite colour; but their peculiar characteristic is that of leaving long white trains behind them, which remain visible for some seconds in the tract in which the Meteors have gone. These tails which I have endeavoured to represent in Plate VI.

* I think I have observed that in summer time, when any kind of falling stars appear, some feature of cirrostratus, however small, may generally be seen about. But this does not appear to be always the case in winter.

Fig. 6. seem to be lost by dispersion; they appear to fly off from all points, increasing in breadth as they become fainter, till at last they cease to be distinguishable. They are generally seen in the intervals of showery weather, and most prevalent before the occurrence of high wind: of which they have been considered by Aratus, Virgil, and other writers as a certain prognostick.* These kind of Meteors abounded, on the night of 10th August, 1811, after a showery day. I have thought that their tails were the result rather of some gas set on fire by the meteor in its passage, than of any of the luminous substance of the Meteor left behind

* Καὶ διὰ νυκτὸς μελαινᾶν ὅτ' ἄσπερες αἰσθῶσι
 Ταρφέα τοῖ δ' ὀπιθεν ρυμοὶ ὑπόλευκαινῶνται
 Δειδελθαι κείνοις αὐτὴν ὁδὸν ἔρχομενοιο
 Πνεύματος, &c. *Arat. Dios. 107.*

Saepe etiam stellas vento impendente videbis
 Praecipites coelo labi, noctisque per umbram
 Flammarum longos a tergo albescere tractus.

Georgic. lib. i. 365.

Pliny also remarks, “Si volitare plures stellae videbuntur quo feruntur albescentes, ventos ex his partibus nunciabunt.”
Plin. Hist. Nat. xviii. 35.

Compare also Lucretius de Rer. Nat. ii. 208. Theophrastus observed of old: “Ὅθεν ἂν ἀσπερες διαπτῶσι πολλοὶ ἀνεμὸν ἐντυθεὶν εἰαν δὲ πανταχοῦθεν ὁμοίως, πολλὰ πνευμαῖα σημαίνουσι.”

Theoph. de Sign. Vent.

it. I may also remark, that if the larger kind of Meteors happen at the same time that these caudate Meteors are prevalent, they also leave this beautiful white and slowly evanescent tail behind them.*

* The train of light which the common Meteors, or *falling stars*, appear to leave behind, and which lasts scarcely a moment, seems frequently to be an hallucination of vision, like the *Δολικοσκιον εγχος* sung by Homer, and quoted by Dr. Darwin, *Zoon.* sect. iii. v. 3.—To which as well as to his paper, *De Oculorum Spectris*, I refer the reader. M. Aubert observed a train of reddish fire left behind the bright Meteor seen at London, Oct. 4, 1783, which lasted above a minute after the Meteor was extinguished. See *Phil. Trans.* vol. lxxiv. 115.

The great Meteor of 18th August, 1783, left corruscations behind it, and moved in an irregular tract. See *Phil. Trans.* lxxiv. 114.

There are some reasons for thinking that the explosion and loud report of some Meteors, and particularly of the great one of 1783, happen at the alteration of their regular course, as if interruption by explosion of hydrogen, which the Meteor might meet with in its passage, or from any other cause, caused the report, and division of the luminous substance of the Meteor. See *Phil. Trans.* lxxiv. 20.

There is one remarkable thing about the explosion of Meteors. The great Meteor of 1718 w , according to Halley, above sixty miles from the earth's surface; and yet at that elevated station the air was capable of communicating sound, as appears clear by the report of the Meteor: a circumstance

SECTION I.

Of the Causes of the Igneous Meteors, described above.

VARIOUS have been the conjectures of different philosophers about the causes of igneous Meteors: their precise cause has, however, never been ascertained. M. De Luc ascribes them to certain phosphorific exhalations, which ascend from the earth, and take fire or become phosphorescent in the air.* We shall see how this hypothesis will agree with their kind of motion, their peculiarities, and the kind of weather which precedes, accompanies, or follows them.

On the above supposition, must we regard them as taking place in the following manner. The exhalation from the earth must be a circumscribed column of some kind of volatile matter, which, when it arrives at a certain elevation, takes fire: this might easily be

* Nicholson's Journal of Nat. Phil. &c. 1812.

noticed by Arbuthnot, and by the Abbé Bertholon in his "De L'électricité des Meteors. 8vo. Lyons, 1787, vol. ii. p. 25. Where are some curious observations on the Feux St. Elme, Feux Follets, and other Meteors.

supposed to happen to phosphorific matter. There are several other appearances which incline one to think, that there are combustible gaseous exhalations from the earth, which afterwards ignite. The next question is, if they are only phosphorific, as M. De Luc calls them, what is the principle of their ignition? They may, perhaps, be ignited, by getting up into a dryer atmosphere. This supposition is agreeable to the known properties of phosphorus, which is preserved in water, but burns if left to dry. It may perhaps be conceived that phosphorous gases may be preserved while passing through a humid atmosphere; but which, when they arrive at a more dry air, spontaneously take fire. The ignition being thus began, it would probably extend down the column of phosphorific vapour, and give the appearance of a descending luminous ball, just such as we see to be the case: and it might go out when it had descended again so low as to be in an air too humid for combustion. Or its extinction may, in other cases, be caused by the column of vapour being interrupted by wind, or any other cause of dispersion.

Upon the above supposition, the motion of the falling star would be exactly retrograde to

that of the ascending column of phosphorific matter. This is agreeable to the popular notion, that many of these Meteors shoot towards the quarter from which wind will subsequently blow. Because if, as I have shown, the wind often changes first above, its current may give an inclination to the ascending column of phosphorific matter; and the burning star, moving back in an opposite direction, would point to the coming wind. This may often be the case; but I have observed that these stars frequently shoot along in different directions: a circumstance which may be supposed to arise from their previous columns of phosphorific matter being inclined differently by different currents, which, by experiments with air balloons, I have found to exist often in the atmosphere at the same time. If these columns of phosphorific matter ascend from the earth when there are different currents of air in the atmosphere, it may be questioned, how it happens that the motion of the falling Meteor is so straight, and why, on the contrary, it is not bent at angles, as its motion is retrograde to that of an ascending column of gas, which may have passed through, and received an inclination from, several currents of air? Possibly, it

may be replied, between the currents there may be a deposition of water, or some other circumstance, which may extinguish burning phosphorus; and then an alteration of the current may be one circumstance that sets a boundary to its combustion, which in other cases may be continued lower. I can conceive that the change of current might interrupt the continuity of the ascending column; and thus the star might go out when it arrived at the interception of the combustible gas. But it is hard to assign a reason why these columns of gas, if such exist, should not be dispersed entirely by the wind which they must meet with in the progress of their ascent; since they sometimes are seen when the wind is blowing very strongly below. This alone would induce one to believe, that they do not really ascend from the earth; but still they may be formed in the air, perhaps at the junction of two currents. It is moreover difficult to conceive why exhalations from the earth should arise in such narrow columns, as they must do, if this explanation of the phaenomena be true.*

* A Meteor, moving in a very unusual manner, was described at Hackney, on the night of the 7th of November, 1811, about five minutes before nine o'clock, in the North: it moved

If the Meteors in question be caused by the ignition of combustible exhalations, it may be easily supposed that they would vary in appearance, according to the peculiarities of the exhaled gas. Neither is it more difficult to suppose varieties in these exhalations, than to suppose their existence at all. The columns of gas might vary in size at different times, and so give place to Meteors of divers magnitudes. The greater the quantity of the exhaled gas, the less likely would it be to be wholly dispersed by the wind: it might, therefore, be carried along horizontally for miles; and, at length taking fire by dryness of the air, by electricity, or by other causes, might give place to such large, irregular, and horizontally moving Meteors, which appear at uncertain intervals, and travel over vast tracts of country. But this seems to be rather an ingenious hypothesis of M. De Luc, than a theory founded on facts.

There are two circumstances about Meteors,

in a direction to the West: its motion was not regular in a straight line, nor in a uniform curve; but it leaped forward by successive jerks, describing a sort of undulated track; and it was of considerable magnitude: after being visible for some seconds, it apparently entered a cloud, and disappeared. The circumstance of its peculiar motion is, I think, worthy of record.

which seem to favour an opinion which I once entertained, that they are somehow connected with the combustion of hydrogen. They sometimes end with a loud report. And one kind of them is most frequent after Rain, and in stormy weather. The separation of the gases of water has been mentioned by M. B. P. Van Mons, in a paper given to the Batavian Society. If hydrogen be thus separated, and partly mixed, as it must be, with common air, and should be ignited, we may conceive a Meteor produced: but this is not sufficient to account for their long course which is generally in a slanting downward direction. The occasional report of the Meteor at its termination may be supposed, however, to be caused by its meeting with hydrogen gas in its descent, and setting it on fire. This explosion, too, may interrupt the column of combustible gas, and thus put an end to the Meteor.

In attributing igneous Meteors to the combustion of gases, which ascend from earth, we assume what cannot be proved: for no one has, I believe, seen such columns of combustible gas.* There are, however, some circumstances

* The opinion of Aristotle about the cause of Meteors seems to agree in some measure with that of M. De Luc. Consult *Arist. Meteor.* lib. i. cc. 2—4.

which would induce a belief of their existence.* The well known Meteor, called Ignis Fatuus, which appears over marshy grounds, and the Electric Light seen about plants hereafter to be described, which one would naturally attribute to the combustion of terrestrial exhalation, lead us to ascribe more elevated Accensions to a similar cause.

SECTION II.

Of Aërolites.

THE large masses of substance which occasionally fall from the air vulgarly called Lunar

* On Sunday evening, Aug. 11, 1805, I observed a very unusual exhalation from an elm tree at Clapton, in the Parish of Hackney; the particulars of which are as follow. Between six and seven P. M. the sky being clear, and the weather warm and dry, and wind South East, a column of darkish vapour appeared to arise from the top of an elm tree at some distance: it looked about two or three feet high: after it had continued a few seconds, it disappeared; and, after a few seconds more, reappeared; and continued in this manner, on and off, for nearly half an hour, when it became too dark to distinguish it any longer. More particulars may be found in the Gent. Mag. for 1805, p. 816.

Stones, Meteoric Stones, Aërolites, &c. of which accurate analyses have now been published, seem to be made up of ingredients composed in proportions different from those of any known terrestrial compound; and are probably formed in our atmosphere; at least such is my opinion, the result of an examination of all the evidence I have been able to collect on the subject. These terrific thunderbolts of Jupiter seem in general to have come down to the earth accompanied by such loud explosions, blazes, and other circumstances as in a less degree attend the larger sort of Fiery Meteors. Indeed all these Meteors may be owing to some common principle of chemical action going on in the higher regions of the atmosphere; which, when more gentle and slow, may only cause the blazing Meteors; but which, when more intense, may go on to consolidate large masses of newly composed substance, and may manifest itself by the fall of Aërolites.* I see no

* An extensive collection of accounts of these phaenomenon was made and published in France. This work was said to be compiled by command of the Emperor Napoléon, who, amidst a life of campaign, imbibed sufficiently the spiritual character of the French nation, to encourage philosophers of all countries, and to attend to the encouragement and promulgation of science.

necessity for supposing with Aristotle and M. De Luc that the gases, to form the Meteors, should ascend from the earth, nor any proof of their ascent; but it may be by means of gases somewhere formed aloft and taking fire that the meteoric stones are formed. The way, in which electricity may be concerned in these processes is at present unknown: and the accounts of the fall of these stones, and the various hypotheses about their causes, are too numerous to admit of a detail of them here. I merely wish to call the attention of Meteorologists to the apparent similiarity of principle of those flaming Meteors which are, and of those which are not, visibly attended with the fall of Aërolites.*

* For Analyses of Aërolites, see Thomson's System of Chemistry, Phil. Mag. &c. For further particulars see also the Chapter on Electricity.

One of the largest Meteoric Stones which has been found, is preserved in M. Sowerby's Museum, at Lambeth in Surry.

CHAPTER IV.

OF THE INDICATIONS OF THE FUTURE CHANGES
OF THE WEATHER.

ONE of the principal purposes to which meteorology may be applied is, that of enabling us to predict, in some measure, the ensuing changes of the weather. In order to do this accurately, a familiar acquaintance with the modifications of the clouds, and indeed with all the operations which are going on above, appears to be necessary. I hardly need lay down the following rule for predicting atmospheric changes. That when two or more contrary inclinations appear, the result must be deduced from those which ultimately prevail; and that when several agreeable signs are seen together, the event may be considered as predicted with additional certainty.* Prognosticks

* A rule laid down of old and sung by Aratus, who says of Prognosticks,

Τῶν μὲν καλοκνησο, καλον δ' ἐπὶ σηματὶ σημά
Σκεπτεσθαι, μεμλον δὲ δυοῖν εἰς ταῦτον ἰοντοιν
Ελπὼρὴ τελεθοι· ἱρίλιτῷ δὲ εἰς θαρσησείας.

Arat. Dios. 412.

of weather may be divided into those which result from the observance of the sky, and of meteorological instruments; and those which are deducible from the habits and motions of particular animals and plants.

The popular prognosticks of Rain, Wind, and other changes of the weather, which with little variety are common in most countries, seem to have been known and observed with accuracy of old. Indeed their being familiar to almost every age and country affords the strongest confirmation of their correctness, to those who have not had constant experience of them.

Although we find familiar mention of the Signs of the Weather in the works of Homer, Hesiod, and among almost all the oriental writings, yet Theophrastus the Grecian naturalist, seems to have been the first who cultivated this branch of meteorological science, and collected together the proverbial rules of judging of the weather; which were shortly afterwards put into verse by Aratus the poet, in his *Διοσημεία*, above two thousand one hundred years ago, and are imitated by Virgil, Lucan, Pliny, Seneca, and others. With little variation, the same rules are to be found

scattered among numerous works of Natural History and Science. And they are popular among the lower classes of modern Europe. Such of them as I have collected by occasional conversation with Mariners, Shepherds, and other persons who spend their lives chiefly out of doors, and who are attentive in noticing these prognosticks, as well as those which I have noticed myself, have I collated with the written accounts of the ancient Greeks and Romans, and subjoined.

SECTION I.

Of Prognosticks of Atmospheric Changes, deducible from the Motions of Animals.

IT was long ago observed by the ancients that, from the peculiar motions and habits of many animals, the consequence, probably, of their sensations of pain or of pleasure, a very accurate judgment might be formed of the approaching changes of the weather; neither has this entirely escaped the notice of more modern meteorologists. But I think they have not bestowed that share of attention to

this subject which it certainly deserves. It is difficult, perhaps, to conceive the manner in which animals become sensible of the approach of particular kinds of weather. We cannot suppose that they are forewarned of it by the appearances of the sky, at least in many cases ; for some animals express signs of uneasiness previous to an alteration of the weather, long before there are any visible signs of change, and often when they have no opportunity of observing what is going on abroad. Dogs, for instance, closely confined in a room, frequently become very drowsy and stupid before Rain. They often sleep all day before the fire, and are almost incapable of being roused.* The same, in a less degree, is observable in Cats. And a Leech, confined in a glass of water, has been found, by its rapid motions, or its quiescence, to indicate wet or fair weather. From an examination of the structure of the brain of animals, they do not appear organized to have any distinct notions of causation ; but they can observe that two particular things are conjoined, or that they follow one another ; and thus from

* On such occasions, I have sometimes found their ears considerably inflamed, a common symptom of illhealth in many animals.

perceiving one, they anticipate and prepare against the occurrence of another. Their prognostication, however, of weather seems in fact to result rather from some impressions on their feelings, than from any accurate observation of what is going on in the sky.* Peculiarities in the electric state of the atmosphere may, I think, be supposed to affect the constitutions of animals in the same manner as they appear to do ours, and may thereby excite either pleasurable or uneasy sensations.†

Rain may be expected, when the Swallow flies low, and skims backward and forward over

* It is a pity that among all our works of comparative anatomy, we have actually no accounts of the structure and Organs of the Brain of different animals. The discoveries of Gall and Spurzheim seem likely to throw some light on this most interesting part of Natural History.

† “ Haud equidem credo quia sit divinitus illis
Ingenium, aut rerum fato prudentia major :
Verum ubi tempestas et coeli mobilis humor
Mutavêre vias, et Jupiter uvidus austris
Denset erant quae rara modo, et quae densa relaxat,
Vertuntur species animorum, et pectora motus
Nunc alios, alios dum nubila ventus agebat,
Concipiunt ; hinc ille avium concentus in agris
Et laetae pecudes et ovantes gutture corvi.”

Virgil. Georg. lib. i.

the surface of the earth and waters, frequently dipping the tips of her wings into the latter.*

When Bees do not range abroad as usual, but keep in or near to their hives,† or when Ducks, Geese, and other Waterfowl, are unusually clamorous, we may also expect wet.

Before Rain, Swine, as well as Poultry, appear very uneasy, and rub in the dust.

Before and during Rain, Ducks, Geese, and other Fowls wash and dive in the waters more

* Among the signs of Rain, Pliny enumerates *Hirundo tam juxta aquam volitans ut penna saepe percutiat*. See also *Obser. Brum. Retr. Swal.* 3d. Edit. London, 1813. Swallows have always been considered as weather guides. They arrive somewhat earlier at Rome than at Paris or London. See the Notes to that immense Body of Meteorological Observations, collected by the Met. Soc. of the Elector of Palatine, in 6 vols. 4to.

† “Nec vero a stabulis, pluvia impendente recedunt
Longius, aut credunt coelo adventantibus Euris
Sed circum tutae sub moenibus urbis aquantur,
Excursusque breves tentant.”

Virg. Georg. lib. iv. 194.

Ἡ λιμνὴν περὶ δὴθα χελιδόνες αἰσσωσι.

Γαστρι τυπλοῦσαι αὐτῶς εἰλυμενον ὕδωρ.

Arat. Dios.

Theophrastus observes as a sign of Rain χελιδόνες τῇ γαστρὶ ὑπλοῦσι τὰς λιμνας. Linnaeus also notices this prognostick, speaking of *Hirundo rustica*.

than usual. Pidgeons also wash before Rain ; and Cats wash their faces ; they have been observed also before Rain to scratch the bark off the trees. In autumn, Flies sting and become unusually troublesome, on the approach of Rain.

Dogs, and other domestic animals, likewise express signs of uneasiness, and are very sleepy and dull before Rain and Snow. Dogs are said to dig great holes in the ground in rainy weather. We had a Dog always busy in digging deep caverns in the earth which he laid in during particular kinds of weather. This Dog was a cross breed between a pug and terrier, remarkable for his sagacity.

If we happen to be abroad, when, after long continued dry weather, the sky is thickening, and Rain approaching, we may frequently observe the Cattle stretching out their necks, and snuffing in the air with distended nostrils ; and often, before Storms, assembled in a corner of the field, with their heads to the leeward.*

The loud and continued croaking of Frogs heard from the pool ; the squalling of the

* *Boves coelum olfactantes seque lambentes contra pilum*
Plin. Hist. Nat. xviii. 35.

Pintado* and the Peacock, the appearance of Spiders crawling on the walls more than ordinary, and the coming forth of Worms, have also been considered as signs of Rain. Most of these have been noticed by Virgil, who has likewise added several more, which have never fallen under my notice,† but which

* This bird is called the Comeback in Norfolk, and regarded as the invoker of Rain. It often continues clamorous throughout the whole of rainy days.

† — “ Numquam imprudentibus imber

Obfuit, aut illum surgentem vallibus imis
 Aeriae fugere grues, aut bucula coelum
 Suspiciens patulis captavit naribus auras
 Aut arguta lacus circumvolitavit hirundo
 Et veterem in limo ranae cecinere querelam.
 Saepius et tectis penetralibus extulit ova
 Augustum formica terens iter, et bibit ingens
 Arcus, et e pastu decedens agmine magno
 Corvorum increpuit densis exercitus alis.
 Jam varias pelagi volucres et quae Asia circum
 Dulcibus in stagnis rimantur prata Caystri
 Certatim largos humeris infundere rores
 Nunc caput objectare fretis nunc currere in undas
 Et studio incassum videas gestire lavandi,
 Tum cornix plena pluviam vocat improba voce
 Et sola in sicca secum spatiatur arena
 Nec nocturna quidem carpentes pensa puellae
 Nescivere hyemem testa quum ardente viderent
 Scintillare oleum et putres conrescere fungos.

Virg. Geor. lib. i. 392.

have been mentioned by many writers, both ancient and modern:* When Cocks crow at uncommon hours, and clap their wings a great deal, it is said to be a sign of Rain; as is the appearance of the Redbreast near houses.

Sparrows chirp particularly loud during Rain, and often begin before it falls, affording thereby for some time previously a prognostick of its coming.

* ——— Cornicum ut saecula vetusta

Corvorumque greges ubi aquam dicuntur et imbres

Poscere et interdum ventos aurasque vocare.

Lucret. de Rer. Nat. v. 1085.

Et quum terrestres volucres contra aquam clangores dabunt,
perfundentes sese, sed maxime cornix.

Plin. xviii. 35.

Rava fulix itidem fugiens e gurgite ponti
Clamans nunciat horribles instare procellas
Haud modicos tremulo fundens ex gutture cantus
Saepe etiam pertriste canit de pectore carmen
Et matutinis acredula vocibus instat
Vocibus instat et adsiduas jacet ore querelas
Quum primum gelidos rores Aurora remittit
Fuscaque nonnumquam cursans per littora cornix
Demersit caput et fluctum cervice recepit.

Cicero ex Arat. de Div. lib. 1.

Ἦπερ καὶ λακέρυζα παρ' ἡϊόνι πρεβεσθῇ

Χειματος ἀρχομενὸν χέρσῳ ὑπεκνύει κορωνή.

Arat. Dios. 217.

See also Aelian de Anim. viii. 7.

If Toads come from their holes in great numbers; if Moles throw up the earth more than usual; if Bats squeak or enter the houses; if Asses shake their ears and bray much; if Hogs shake and destroy the cornstalks; if Oxen lick their forefeet, or lie on their right side; or if Mice contend together or squeak much, according to many authors we may expect Rain. Sheep and other Cattle gamboling or running about and appearing very uneasy also portend the same.

Sometimes previous to Rain, Sheep and Goats seem more desirous to graze, and quit with reluctance their pastures.

Among other things the activity of Ants in carrying about their eggs,* the voice of the solitary Crow,† and the frequent immersion of many Waterfowl‡ have been considered as indications of Rain.

The garrulity of Crows, Ravens, Rooks, and other birds of this sort, is indeed well known; “*Corvus aquat*” is a proverb cited by Erasmus.

* *Formicae concursantes aut ova progerentes.*—*Plin.*

† *Horat. Carm. lib. iii. Od. 17. l. 13.—Od. 27. l. 9.—Claudian. xv. 493.—Lucan. v. 555.*

‡ *Plin. lib. xviii. 35.—Arat. Dios. 210.—Homer. Il. 8. 461.—Varr. Frag. Catelect.*

But we must distinguish between the voice of the Raven before Rain, perched solitary on a tree and uttering a harsh cry, from his deep and peculiarly modulated voice when sailing round and round high up in the air before and during serene weather.* The Raven as well as other birds often soars at an elevation much beyond what we are apt to imagine. When at the top of Cader Idris near Dolgelly, I observed these birds flying considerably above the summit of that mountain on which I sat.

The hooting and screeching of Owls often indicates a change of weather. They hoot in fact during variable weather: when fair is about to be changed for wet, or wet for fair, a similar disturbance of their feelings from atmospherical causes probably takes place which makes them hoot. Refer to Virgil's observation in Georg. lib. 1. and Professor Heyné's note on them. Authors have added, the snapping of the flame of a candle or lamp, mentioned by Aratus and Virgil, as a sign of wet.

Hesiod mentions the singing of a bird, which he calls *Kuxxvž*, as foreboding three days' Rain ;

* For numerous collateral passages about this and other prognosticks I must refer to my edition of the *Diosemeia* of Aratus, London, 1815. This work is reprinted in the *Classical Journal* published by M. Valpy.

and a Leipsick editor renders the word *Cuculus*; on what authority I know not.*

The Missletoe Thrush, *Turdus viscivorus*, frequently sings particularly loud and long before Rain. I have known this bird sing throughout a severe Storm. It is from this circumstance called the Stormcock.

Mariners at sea expect a Storm when the Stormy Petrels, *Procellariae pelagicae*, shelter themselves in numbers under the wake of the vessel.†

Pennant observes, that on the Island of St. Kilda the Fulmar *Procellaria glacialis* is very useful in foreboding the direction of the Wind. When these birds return to the land in numbers there will be no West Wind for a long time; when, on the contrary, they return to the Ocean, a Zephyr is expected.‡ Several

* Ἡμος κυκκυξ κοκκυζει δρυος εν πετάλοισι
Το πρόιον, τρεπει τε βροτεις επ' επειρονα γαῖαν,
Τημος Ζευς υἱοι τριτω ἡματι μηδ' αποληγαι.

Hesiod Op. et Dios.

† Bewick's Birds, 2nd vol. of Waterfowl, 224.

‡ Pennant's Arctic Zool. This is also said by Aratus of the Erodus,

‘οτ’ Εροδιος ου μαλα κοσμον
Εξ ἄλος ερχηται φωνη περιπολλα λεληκως.

Arat. Dios.

prognosticks of Storms are mentioned by the old Greek writers which are not observed on our shores, neither do we know exactly what birds they alluded to. I have observed that previous to windy weather Pigs seem very uneasy and run about throwing up their heads and squeaking.

Magpies before and during Wind fly about in small companies, and make a fluttering noise.

When the Seagulls come in numbers to shore, and make a noise about the coast; or when, at sea, they alight on ships, the sailors consider it a sure foreboding of a Storm. These circumstances were known of old.* Before Storms, too, the Porpus, Dolphin, and Grampus, come to the shore in large bodies.

When Dolphins play about the surface of a calm sea, Pliny observes Wind may be expected from that quarter from which they have come.† Authors have added tame Swans flying against the Wind as a sign of Rain, which I have observed to be true at Withyham, where Swans and numerous other Waterfowl inhabit the ponds.

* Virg. Geor. lib. 1.—Plin. lib. xviii. c. 35.

† Plin. Hist. Nat. lib. xviii. 35.

SECTION II.

Of Prognosticks of Weather taken from the Observance of Plants and Flowers, &c.

IN the oeconomy of nature we find that plants, like animals, adapt their motions to their wants: some expand their flowers to the sun, and close them at eventide; others expand their flowers in the evening, open before Rain, or perform various other functions, the result of their particular natures, and to which the varying states of the atmosphere are specific stimuli. From an accurate and constant observance of these, many prognosticks of the ensuing weather have been deduced; of which I insert the following, rather on account of their popularity, than because I have noticed many of them myself.

Chickweed has been said to be an excellent weatherguide: when the flower expands freely, no Rain will fall for many hours; if it so continue open, no Rain for a long time need be feared. In showery days the flower appears half concealed, and this state may be regarded as indicative of showery weather; when it is entirely shut we may expect a rainy day.

If the flowers of the Siberian Sowthistle remain open all night, we may expect Rain next day.

Before showers the Trefoil contracts its leaves,* as does the *Convolvulus* and many other plants.

Lord Bacon observes that the Trefoil has its stalk more erect against Rain.

There are, however, many plants whose flowers are opened at particular periods of the day, as the *Tragopogon porrifolius* and *T. pratensis*; which do not open their flowers much earlier or later, according to the state of the weather.

Lord Bacon mentions a small red flower, growing in stubble fields, called by the country people Wincopipe, probably the *Anagallis arvensis*, which if it opens in the morning ensures us a fine day.

To these, the closing of the flowers of the Pimpernel, and numerous other prognosticks might be added, but it would swell this section beyond its limits.†

* Plin. Hist. Nat. xviii. 35.

† The reader may consult Lord Bacon's *Sylva Sylvarum*, cent. ix. cap. 823—830. Numerous other omens of the weather will be found in the Poems of Aratus, of which the author is preparing for the press an enlarged edition.

SECTION III.

Of the Prognosticks of Weather from the Appearance of the Sky.

AFTER clear weather the appearance of light streaks of Curlcloud in the sky is often the first sign of a change. These increase, descend, become Waneclouds, then Stackenclouds form underneath and inosculate, and Rainclouds are the event of the process—begun by fine filaments of the cirrus.

When the Curlcloud is seen in detached tufts, called Mares' Tails, it may be regarded as a Sign of Wind, which often follows, blowing from the quarter to which the fibrous tails have previously pointed. The change from Curlcloud to Wanecloud, and indeed the great prevalence of the latter cloud at any time must be regarded as an indication of an impending fall. The most formidable features of this modification are the large spreading and dense sheets of it which veil the sky before Rain, and in which the sun often sets shrouded foreboding a rainy day,

The prevalence of Waneclouds at eventide had been noticed as a sign of Rain long before

the specific nature of the different clouds was attended to; and the vivid colours of red and crimson seen in this cloud when the sun is near the horizon, gave rise to many proverbs about the red evening, and its favourable omen to the traveller; a remark quite as trite among country people, as the grey morning before a fair day. Both these prognosticks are noticed by Jesus Christ, and recorded by St. Matthew, “*But he answered them: in the evening you foretell fair weather when the sky is of a bright red; and in the morning foul weather when the sky is of a dusky red.*”* Dappled grey mornings or those marked by the lofty confluent nubeculae of the Sondercloud often usher in a fair warm day.† Indeed the appearance of cirrocumulus in general indicates

* Οψίας γενομένης λεγέιε ευδιά: πυρράζει ὁ ουρανός προῖ
σημειον χειμῶν: πυρράζει γὰρ στυγναζων ὁ ουρανός.

Matthew, chap. vi. 2.

† An old proverb reminds us,

An evening red, and a morning grey,
Are sure signs of a fine day;
Be the evening grey, and the morning red,
Put on your hat, or you'll wet your head.

The Italians have:

Sera rosa e nigro matino
Allegra il Pelegrino.

an increase of temperature. Heyne, in his edition of Virgil, speaks of the round nubeculae of this cloud as being called oviculae or little sheep from their appearance, and as indicating fair weather.*

The denser features of the Sondercloud, or those whose nubeculae are dense compact round aggregates, are generally indicative of a Storm.

Before storms too a feature of cirrostratus appears of a cymoid figure like some architectural ornaments. Pl. IV. Fig. 1.

It is generally in variable weather that a line of cirrostratus breaks out into transverse bars, as in Pl. II. Fig. 2. and the more it approaches in its figure to the form of the Cyma, the greater is the likelihood of a Storm.

The irregular increase of cumuli, particularly toward evening, and in general their not subsiding in the evening, may be regarded as a forewarning of wet.†

* Among the many rules, such as are contained in our old Almanacks, we find

If woolly fleeces strew the heavenly way,

Be sure no rain disturb the summer day.

Virgil and Aratus, however, made the *vellera lunae*, or clouds like fleeces of wool, rainy signs.

† Clouds are said to disperse on the rising of the moon.

When cumuli sailing along have their fleecy protuberances curling inward, variable weather may be expected, such cumuli often rapidly anastomose with cirri or with cirrostratus above them, and produce showers.

When a dense and uniform veil of cloud covers the sky, as is often the case before Rain, with a still air, musick and noises are heard a great way off, which has caused the far propagation of sounds to be regarded as a prognostick of Rain. The sound of distant church bells in the country often serves this prognosticative purpose. I remember well, being in Cornwall in August, 1804, that the bells of St. Vepe on such occasions could be heard as far as Boconnoc.

In Wales the common people say, that when the mountains have their nightcaps on, the Rain will soon fall.

While I was in Wales, in 1814, during a showery time, the peaks of the mountains were generally capped with clouds of the low and nimbiform kind. The clearness of the tops of mountains is, on the contrary, a sign of the

I was told this by some French sailors, while crossing from Calais, in 1815, and M. Herschel mentioned having noticed often the same thing.

fairness of the weather. Long cirrostrati and other elevated clouds often alight on the summit of real mountains, as they do on mountainlike cumulostrati, and are equally indicative of wet weather. Descending Mount Jura, in Switzerland, on Monday the 29th of July, 1822, I noticed the tops of the Alps of the Savoy across the Lake to be cloudcapped, particularly Mount Blanc: in twenty minutes afterwards there fell a violent Storm.

When the rapid formation and disappearance again of clouds take place in fine days, as is often the case, we may suspect the serenity we enjoy, and look forward to a change. I have seen little Stackenclouds form and disappear in the space of a few minutes; while Curlclouds form, change their figure to spots of Sondercloud and disappear, at the same time at a more elevated station.

Luminous phaenomena about the sun by day, or the moon by night, being generally produced by the intervention of the Wanecloud, indicate the fall of Rain, Snow, or Hail, according to circumstances; indeed, many of the signs of Rain are likewise, under other circumstances of time of year, &c. prognosticks of Snow. The Halo is one of the most certain

signs of Rain and Snow that we have; though I have even known this fail in its accustomed indication. The Parhelion and other peculiar refractions also forebode rainy weather.*

The simple Corona often occurs in many kinds of thin clouds, and frequently without any Rain following; but we may generally expect wet when it is coloured, double, or with any remarkable peculiarities. We do not know at present under what peculiar circumstances Halones and Coronae are coloured; but it must be done by something particular in the structure of the cloud which produces them.

The Halo appears at times in a sky where there appears to an inattentive observer little or no visible obscuration, the interstitial space between the rings seems quite blue, like the sky in general. Some very fine diffused haziness, perhaps cirrostratus, however produces by refraction the white ring of the phaenomenon. We often find on such occasions the light of the stars dim, and a more complete obscuration, and eventually Rain to follow. Pliny has noticed this obscuration of the light of the

* Consult Arist. Meteor. lib. iv. cc. 3—6; the Dios. of Aratus; the Natural History of Pliny; the Natural Quest. of Seneca, &c.

sun by day, and of the stars by night, without any definite cloud to forebode Rain, as had been before mentioned by the more ancient writers.*

The Rainbow, which is only an effect of nimbus, has been regarded as a sign of Rain; which it may rightly be, for it often appears in the nimbus before that cloud, weeping in his sable shroud, has reached the spot where we stand. *Bibit ingens arcus*, says the Mantuan bard, who took most of his prognosticks from the Diosemea of Aratus.†

Of the particular indications of the haze in the atmosphere we may notice, that the mere hazy or pale colour of the Moon often forebodes

* See Plin. Hist. Nat. lib. xviii. c. 35. The Rain which falls under such circumstances is gentle and of long continuance, and often extends a great way. The vulgar prejudice, however, about the extent of Rain in general, is quite unfounded. H. Culhwe Mabinogion, in allusion to this:—Ti á gefi y cyvarws a noto dy ben à th davawd, hyd y syc gwynt, hyd y gwlyc, gwlaw hyd y treigl haul a hyd yz amgyfred môr.

† Η διδυμη ἐζώζε διὰ μέγαν οὐρανὸν ἰρίσ

Η καὶ ποῦ τις αὐτὰ μελαινομένην, ἐκεῖ ἀστὴρ.

Arat. Dios. 210.

See also Virgil, Geor. i. 380. Platus Curcul. Statius Thebaid, ix. 405. Oppian, Theophrastus, and others.

Rain, while she is more brazen, red, or copper coloured before Wind. This corresponds with the red in the clouds, before noticed as a sign of Wind.*

SECTION IV.

Of several other Prognosticks of Rain, and of the Return of fair Weather.

MANY indications of atmospheric changes have been noticed by different authors, which I have not determined by my own observation to be correct, such, for example, as the smell of drains and suspools; the excrescence of fungi about the wicks of lamps and candles; the flaring and snapping of the flame; the soot taking fire in sparks round the smoky outside surface of a pot on the fire; the wicks of can-

* Hence the proverbial verse noticed elsewhere,

Pallida Luna pluit, rubicunda flat, alba serenat.

The cumulostratus being a state of the clouds going on to become nimbus, has been regarded as one of the rainy signs, and has given rise to the following adage :

“ When Clouds appear like rocks and towers,
The earth’s refreshed by frequent Showers.”

dles not being easily lighted, and many others of this sort. Wind has been indicated by candles burning unequally, or by coals casting off more ashes than usual.

Pain felt in limbs formerly broken, or in other injured parts of the body, often forebodes Rain. On Wednesday, the 23d of June, 1813, the extensor tendon of my forefinger was divided by accident, and though by means of a new substance interposed between the divided ends of the tendon, its functions were restored, and the wound completely healed, yet I always feel an uneasy sensation in it before rainy weather, very similar to that which I experience after having much exerted it.

SECTION V.

Of Indications of the Return of Fair Weather.

THE absence of those circumstances which forebode or accompany foul weather may generally be considered as indicating a return of fair. So Virgil mentions the clear and bright appearance of the Moon and Stars, after they have long been hazy and confused, to indicate

approaching serenity.* Every one is acquainted with the additional clearness of a night intervening between wet and clear frosty weather. By the general disposition of the clouds, we may, in general, prognosticate fair or rainy weather. In the most settled weather, only diurnal cumuli appear; they are well defined, increase towards the middle of the day, and decrease at night. Of this enough has been already said in the chapter on the clouds. The brightness and heat of the fire in winter

* Nec minus ex imbri soles et aperta serena
 Prospicere et certis poteris cognoscere signis
 Nam neque tum stellis acies obtusa videtur
 Nec fratris radiis obnoxia surgere luna
 Tenuia nec lanae per coelum vellera ferri
 Non tepidum ad solem pennas in littore pandunt
 Delectae Thetydi halcyones, non ore solutos
 Inmundi meminere sues jactare maniplos.
 At nebulae magis ima petunt, campoque recumbunt;
 Solis et occasum servans de culmine summo
 Nequidquam seros exercet noctua cantus.

Virg. Geor. i. 403.

Tum liquidas corvi, presso ter gutture voces
 Aut quater ingeminant, et saepe cubilibis altis
 Nescio qua praeter solitum dulcedine laeti
 Inter se foliis strepitant juvat imbribus actis
 Progeniem parvam dulcesque revisere nidos.

Virg. Geor. i. 414.

often indicate frosty and clear weather, as does the lodgment of the moisture on the windows; for it demonstrates a cold and frosty atmosphere abroad.* To the above signs of atmospheric changes, many others might be added; but to enumerate all which different authors have mentioned, would swell too much this chapter, and I must refer the reader, for further information on this subject, to the chapter on superstitions originating in meteorological phaenomena, wherein I have collected and inserted more of these trite and ancient sayings about the prognosticks of the weather.

SECTION VI.

Of the Prognosticks of Seasons.†

THE constant desire to know what is about to happen, which our natural curiosity and the

* See the *Shepherd of Banbury's Calendar*, London, 1748.

Lord Bacon has adduced many conjectures why Herons flying high forebode Wind, and Kites doing the same forebode fair weather.

† In commemoration of the Seasons and keeping journals, it becomes necessary to use the names of months and days.

interest we take in future events occasion, added to the use which agriculturists and farmers may make of some knowledge of the approaching weather, have always rendered men very attentive to the signs of the seasons; and made them watch attentively for those circumstances from which experience had taught them to anticipate severe winters, hot summers, late springs, plentiful autumns, and other vicissitudes of the year.

In order to ascertain the varieties in the Seasons, as indicated by the flowering of plants, we ought to become accurately acquainted with their natural periods, and the average time of flowering which belongs to each species. I have of late made an artificial division of the seasons of different plants into six distinct periods, to each of which respectively a certain

M. Howard, and the Quakers in general, refuse to adopt the old established names of January, &c. and have adopted a numerical nomination, which is next to impossible to recollect. I submit whether the following names would be objectionable to them:—Snowmonth, Rainmonth, Windmonth, Showermonth, Flowermonth, Heatmonth, Haymonth, Harvestmonth, Fruitmonth, Grapemonth, Fogmonth, and Wintermonth, corresponding to Nivose, Pluviose, Ventose, Germinal, Floreal, Thermidor, Praireal, Messidor, Vindemiare, Frumaire, Brumaire, &c. and to the German Wintermonat, &c.

number of species belong. Dividing then the reign of the Goddess of Blooms into six principal portions, we shall begin with the first in the order of phaenomena. The

PRIMAVERAL FLORA

(or Equinoctial Flora) may be said to commence with the first breaking of the frost before February; it comprehends the Snow-drop, the Crocus, the Coltsfoot, all the tribe of Daffodils, Narcissi, Jonquils, and Hyacinths, the Primrose, Cyclamen, Heartsease, Violet, Cowslip, Crown Imperial, and many others. The Equinox being also passed, and the leaves beginning to bud forth amidst a display of blossoms on the trees, another period may be said to begin, and May ushers in the

VERNAL FLORA,

with Tulips, Pæonias, Ranunculi, Monkey Poppy, Goatsbeards, and others: at this time the fields are bespangled with the golden yellow of the Crowfoot, or blue with the Harebells. The whole bosom of earth seems spread with a beautiful carpet to soften the path of Flora, at this delicious season. By and by towards the middle of June, the approach of the Solstice is marked by another set of flowers; and the Scarlet Lichnis, the various

Poppies, the Lillies and Roses, may be said to constitute the

SOLSTITIAL FLORA.

As the year declines, the

AESTIVAL FLORA,

corresponding to the Vernal, paints the garish eyes of the Dog Days with Sunflowers, China Asters, Tropoeoli, African Marigolds; and other plants which love heat. The

AUTUMNAL FLORA,

answering to the Primaverall, then introduces Michaelmas Daisies, Starworts, and other late blowing plants, with their companions Fungi and Mushrooms, till at length bleak Winter shows only a few Hellebores, Aconites, and Mosses, belonging to the

HIBERNAL FLORA

of this dreary season.*

* The following verses, extracted from a newspaper, said to be a translation of some Sweedish Linnean Lines, by P. V. Dessauls, seem to allude to the progress of the blooming train of Flora. The dreamer is in imagination dead, but yet living as the Earth; and the Snow being taken off by the vernal Sun, the different Flowers take their turn to exhibit the beauties of their gay wardrobe. The apparent explanation of the dream, by a Vestal Maid going to sleep hugging her Cat, is whimsical enough.

Lord Bacon, who was so well calculated to observe and compare facts, collected numerous

I DREAMT that I died, but that after my death,
I still was percipient clay ;
The Earth was my body, the Air was my breath,
And my Blood flow'd in rivers away :
Then Flora, who trod the gay flowery mead,
With gay colours bespangled the ground ;
And what's more, my olfactory senses to feed,
Shed the balm of sweet odours around !

And she call'd the gay nymphs that attend in her train,
In colours so variously drest,
And, doffing the white shroud wherein I was lain,*
They exultingly bloomed on my breast !
And they took it in turn to figure away,
As their showing-off season came round ;
While lady Arundo soft music did play,†
And Diana beat time on the ground !‡

But Thetis was heavier than the rest,||
And her weight I with agony bore ;
When she rose, the blood flowed up in my chest,
As the tide rises up on the shore ;
But my heart was of rock in a mountain dell,
Whence torrents of liquid did flow ;
And the nymphs as they danced, and sipp'd at the well,
More blooming and fresher did grow !

* The Snow melting in Spring.

† The music of Wind blowing into Reeds, which first suggested Flutes.

‡ Diana, or the Lunar influence measuring the time of the Seasons.

|| Thetis, or the spring tide pressing on the shore.

prognosticks of the Seasons which are recorded among his works on natural history. I shall mention a few of these as subjects for future observation; though, as far as my own experience goes, the cases of exception are nearly

Galantha, the fair, in a robe of white,
More modest than colourless snow,
Was the first who footed, left hand and right,
On the frolic fantastical toe:

Daffodilla, the next, was a gaudy Miss,
With a yellow vest and a green gown;
She stoop'd and she gave Hyacinthia a kiss,
And nodded her jealous head down!

For she view'd her fair rival step up by her side,
Scylla gracefully vested in blue,
Whom Narcissus would surely have pick'd for his bride,
When bathed in the morning dew;
But she gave place, in the wavering round,
To a nymph of great power to lure,
Amaryllis, whom all the fresh vallies resound
With Euphonia of music pure!

Then Tulipa, gaudy coquette, kept rule,
Who sets such a price on her features,
And dresses for every holiday fool,
Who capriciously pays for such creatures.

Silene the next, so sweetly perfumed,
Stole nightly my bosom along;*
And was follow'd by Rosa, who blushing assumed
Preeminence over the throng!

* The Silene Noctiflora.

as numerous as those which correspond with the rules. According to Bacon, a moist and cool summer bodeeth a hard winter; a hot and dry summer and autumn portendeth an open beginning of the winter, and a cold midwinter and spring; an open and warm winter presageth a hot and dry summer, particularly when there are winter Showers.

Now, all on a sudden, in a painted scarf,
 Came Pavora and Pluvia* smart,
 Introducing a fiercelooking, fiery maid,
 Who pierced my heart with a dart—
 'Twas the goddess Electra, with auburn hair,†
 To whom attic dwellings are given;
 Who, followed by thundering bailiffs there,
 Lap out of the window of Heaven!

The concussion was sharp, and great was the smart,
 And then to my great surprise,
 I first dreamt I was dreaming, and then with a start,
 I awoke and I rubbed my eyes.
 I had dozed, dear Felina, with thee on my breast,‡
 In one of the Paphian bowers,
 And thy fragrant breath, as we both caress'd,
 Had set me a dreaming on flowers.

* Fear, and a smart Shower.

† The electricity of Thunder and Lightning.

‡ Felina cognonem sumptum a fele a Cat.

Some curious remarks on the fragrant breath of Cats, and on the perfumes from their mouths when angry, may be found in the Gent's and other Periodical Magazines.

The earlier or later appearance of birds of passage is said to correspond with the earlier or later commencement of the seasonable weathers ; and to afford thereby a prognostick. But for many years I have observed that this is not precisely the case with the Swallow tribe. If it were generally true it would tend to establish a connexion between the weather of places where the birds come from and that of those countries whither they go. But when the later appearance of migratory fowls accompanies late seasons, it is probably because the cold unseasonable weather compels them to hide themselves and prevents their coming abroad and being seen.* The occasional early appearance of a single Swallow has been proverbially noticed as not being indicative of summer †

M. White in his Natural History of Selborne

* Refer to the Calendar at the end of this work.

† It is remarkable, that most countries have a similar proverb relating to the Swallow's accidental appearance before its usual time. The Greeks have Μία χελιδὼν ἔαρ ὃ ποιεῖ ; the Latins, Una Hirundo non facit ver ; the French, Une hirondelle ne fait pas les printems ; the Germans, Eine Schwalbe macht keinen Fruling ; the Dutch, Een Swaluw maakt geen zomer ; the Swedes, En Svala gör ingen sommar ; the Spanish, Una Golondrina no hace verano ; the Italians, Una Rondine non fa primavera ; and the English, One Swallow doth not make a summer.

has given a list of the times of the first appearance of migratory birds for several years : and I have given tables of their appearance in Nicholson's Phil. Jour. and in my Observations on the Brumal Retreat of the Swallow,* whereby the reader, by comparing the birds' appearance with the seasons, may obtain some information on this point.

The abundance of berries in the hedges is said to presage a hard winter, but this often fails.

SECTION VII.

Of Solar and Lunar Influence.

THE influence of periods of day and night on many diseases which have been incontrovertibly proved, and the recurrence of many after certain intervals of time, show that there is some truth in the notions of many physiologists about Periodicity; and that this is probably effected by means of some unknown

* Nat. Hist. Swallows, Underwin, London, 1817, 5 edit. Appendix.

changes produced in the weather. We do not know yet what regulates atmospheric changes in general; how Electricity becomes so distributed as to produce those various effects which analogy leads us to ascribe to it; in short, we have no good general theory of meteorology, as we have of astronomy, mechanics, &c. The old notions of astrologers about the conjunctions of planets involve too many palpable absurdities to allow us to collect any useful information from their writings.

But it is certain the place of the Moon has much influence on the weather. That changes of weather oftener take place about the full and new of the Moon and about the quadratures, than at other times, is really a fact founded on long observation, and is quite conformable to what we actually know, respecting the Moon's influence on the Tides.*

There is yet another extremely curious circumstance about the effect of the place of the Moon: it is well known to physicians that there

* A Proverb says :

In the wane of the Moon

A cloudy morning bodes a fair afternoon.

Also. Rain in the new moon, fair in the old, &c. See *Ray's Collection of Proverbs, and Erasmi Adagia.*

are periods of greater and lesser irritability in the human body, and that at the irritable periods many diseases occur to which the patient may be predisposed: now it seems by the result of long continued observation, that these periods of irritability oftener occur about the new and full of the Moon, than about the quarters. Every body almost must know from their own experience, that they get up in the morning on particular days less disposed to be pleased, and with more general irritability than usual; these days also happen nearer to the times of the full Moon, or of the new Moon, than to that of either quadrature. To bring this observation into a smaller compass, and to confirm it by future remarks, I have proposed to meteorologists to divide the Lunar revolution into four equal parts or weeks, in the middle of each of which week one of the changes of the Moon shall take place. By doing this we shall find the greater proportion of headaches and nervous diseases of many kinds to occur in those weeks, in the middle of which the opposition and conjunction of the Moon shall take place. Moreover, the sudden occurrence of East Winds, so obnoxious to nervous persons, seem to me to produce more

violent effects when they occur near to the conjunction or opposition of the Moon.

That the Lunar influence which I have described exercises its power over the animal machine, by means of some changes effected in it by the Electricity of the Atmosphere, is to me more than probable. Occasionally I have observed that similar headaches, shiverings, and other nervous disorders, which occur about the time of the novilunar and plenilunar changes, also happen at other times when from the occurrence of Thunderstorms and other the like phaenomena, the electricity of the air is disturbed. It may be observed that the approach of Storms, particularly those which are highly electrified, is generally anticipated by certain nervous people by the occurrence of those disorders which they are predisposed to incur; a particular kind of headache, occurring in the forehead, but distinguished from a headache of indigestion, by its taking place even during a cathartic operation, affords a familiar proof of my observation. These cephalalgias begin by slight symptoms, observe a climax, and then rapidly decline. The period of their greatest exacerbation, though commonly about III in the

afternoon, yet sometimes varies according to the period of the electrical change in the air. I have experienced this very thing repeatedly, and have sometimes said during fine weather, that I suddenly felt certain that there existed a distant Storm somewhere, not very far off, which has been afterwards proved to be true, by our observing the Scud or broken fragments of nimbus flying along in the Wind. Now an electrified cloud will produce a sphere of non-electrified air around it, and beyond that throw the atmosphere into an opposite Electricity. Whether the positive, the negative, or the non-electrified portion of air produces the headache, is as yet undiscovered.

SECTION VIII.

Proverbs relating to the Months, Seasons, &c.

PROVERBIAL phrases and adages are generally founded on observation, and these are the less likely to be compared with false and vain theories, because they are the philosophy of the unlettered hinds, who have nothing but experience to go upon in establishing rules. That

the reader may judge from time to time how far any of these are correct, and may compare them with his own experience, I insert the following, most of which were collected by Ray:*

Janiveer freese the pot by the fire.

If the grass grow in Janiveer,

It grows the worse for't all the year.

Who in Janiveer sows oats, gets gold and groats.

Who sows in May, gets little that way.

If Janiveer calends be summerly gay,

'Twill be winterly weather till the calends of May.

On Candlemas Day throw candle and candlestick
away.

When Candlemas Day is come and gone,

The snow lies on a hot stone.

February fill dike, be it black or be it white:

But if it be white, it's the better to like.

Februeer doth cut and shear.

The hind had as lief see his wife on the bier,

As that Candlemas Day should be pleasant and
clear.

February makes a bridge, and March breaks it.

† See also an entertaining book called *Time's Telescope*, published in 12mo. in London last year, 1814, p. 358.

March in Janiveer, Janiveer in March I fear.

March hack ham, comes in like a lion, goes out
like a lamb.

A bushel of March dust is worth a king's ransom.

March grass never did good.

A windy March, and a showery April, make a
beautiful May.

A March wisher is never a good fisher.

March wind and May sun, make clothes white
and maids dun.

So many frosts in March, so many in May

March many weathers.

March birds are best.

April showers bring forth May flowers.

In April the cuckoo show his bill.

In May he sing night and day.

In June he change his tune.

In July away he fly.

In August away he must.

Chaucer writes in his Canterbury tales :—

*When that Aprilis with her showery soote
The droughte of March had pierced to the roote.*

When April blows his horn, it's good both for
hay and corn.

A cold April the barn will fill.

An April flood carries away the frog and her brood.

A cold May and a windy, makes a full barn and a findy.

The merry month of May.

April and May are the keys of the year.

May, come she early or come she late, she'll make the cow to quake.

Beans blow before May doth go.

A May flood never did good.

Look at your corn in May, and you'll come weeping away.

Look at the same in June, and you'll come home in another tune.

Shear your sheep in May, and shear them all away.

A swarm of bees in May is worth a load of hay ;
But a swarm in July is not worth a fly.

Calm weather in June sets corn in tune.

If on the eleventh of June it rain,*

It foretells a wet harvest, men sain.

If the second of July it be rainy weather,†

'Twill rain more or less for four weeks together.

A shower in July, when the corn begins to fill,
Is worth a plough of oxen, and all belongs there till.

* St. Barnabas.

† The Visitation.

No tempest, good July, lest corn come off blue by.
Dry August and warm, doth harvest no harm.
If the twentyfourth of August be fair and clear,*
Then hope for a prosperous autumn that year.
September, blow soft, 'till the fruit's in the loft.
Good October, a good blast,
To blow the hog acorn and mast.
November take flail, let ships no more sail.
When the wind's in the East, it's neither good
for man nor beast.
When the wind's in the South, it's in the rain's
mouth.
When the wind's in the South,
It blows the bait into the fishes' mouth.
No weather is ill, if the wind be still.
A hot May makes a fat churchyard.
When the sloetree is as white as a sheet,
Sow your barley whether it be dry or wet.
A green winter makes a fat churchyard.
Hail brings frost in the tail.
A snow year, a rich year.
Winter's thunder's summer's wonder.

* St. Bartholemew.

Drought never bred dearth in England.

Whoso hath but a mouth, shall ne'er in England
suffer drought.

When the sand doth feed the clay,
England woe and welladay.

But when the clay doth feed the sand,
Then it is well with Angle Land.

After a famine in the stall,
Comes a famine in the hall.

When the cuckoo comes to the bare thorn,
Sell your cow, and buy your corn :
But when she comes to the full bit,
Sell your corn, and buy your sheep.
If the cock moult before the hen,
We shall have weather thick and thin ;
But if the hen moult before the cock,
We shall have weather hard as a block.

As the days lengthen, so the cold strengthen.
If there be a rainbow in the eve, it will rain
and leave.
But if there be a rainbow in the morrow, it will
neither leed nor borrow.

A rainbow in the morning
Is the shepherd's warning.
But a rainbow at night
Is the shepherd's delight.

When the clouds are upon the hills, they'll come
down by the rills.

Winter's thunder, and summer's flood,
Never boded Englishman good.

If Candlemas Day be fair and bright,
Winter will have another flight :
If on Candlemas Day it be shower and rain,
Winter is gone, and will not come again.

If St. Paul's Day be faire and cleere,
It doth betide a happie yeere.

I insert in conclusion the well known rules
of the Shepherd of Banbury :

If the sun rise red and fiery, wind and rain.*
If cloudy and it soon decrease, certain fair
weather.

Clouds small and round, like a dapple grey
with a North wind, fair weather for two or
three days.

Large cloudslikerocks, forebode great showers.

If small clouds increase, much rain.

If large clouds decrease, fair weather.

Mists, if they rise in low ground and soon
vanish, fair weather.

* The same is observed of the Moon, of whose three several
indications the adage says,

Pallida luna pluit, rubicunda flat, alba serenat.

If mists rise to the hilltops, rain in a day or two.

A general mist before the sun rises, near the full moon, fair weather.

If mists in the new moon, rain in the old.

If mists in the old, rain in the new.

Observe that in eight years time there is as much Southwest wind, as Northeast, and consequently as many wet years as dry.

When the wind turns to Northeast, and it continues two days without rain, and does not turn South the third day, nor rain the third day, it is likely to continue Northeast, for eight or nine days, all fair; and then to come to the South again.

If the wind turns again out of the South to the Northeast with rain, and continues in the Northeast two days without rain, and neither turns South, nor rains the third day, it is likely to continue Northeast for two or three months.

After a Northerly wind for the most part two months or more, and then coming South, there are usually three or four fair days at first, and then on the fourth or fifth day comes rain, or else the wind turns North again, and continues dry.

If the wind returns to the South within a

day or two without rain, and turn Northward with rain, and return to the South, in one or two days more, two or three times together, after this sort, then it is likely to be in the South or Southwest, two or three months together, as it was in the North before.

Fair weather for a week, with a Southern wind, will produce a great drought, if there has been much rain out of the South before. The wind usually turns from North to South, with a quiet wind without rain, but returns to the North with a strong wind and rain. The strongest winds are when it turns from South, to North, by West.

Clouds. In summer or harvest, when the wind has been South two or three days, and it grows very hot, and you see clouds rise with great white tops like towers, as if one were upon the top of another, and joined together with black on the nether side, there will be thunder and rain suddenly.*

If two such clouds arise, one on either hand, it is time to make haste to shelter.

If you see a cloud rise against the wind or side wind, when that cloud comes up to you,

* This is the formation of cumulostratus.

the wind will blow the same way that the cloud came. And the same rule holds of a clear place, when all the sky is equally thick, except one clear edge.

Sudden rains never last long: but when the air grows thick by degrés, and the sun, moon, and stars shine dimmer and dimmer, then it is likely to rain six hours usually.

If it begin to rain from the South, with a high wind for two or three hours, and the wind falls, but the rain continues, it is likely to rain twelve hours or more, and does usually rain till a strong North wind clears the air. These long rains seldom hold above twelve hours, or happen above once a year.

If it begin to rain an hour or two before sun rising, it is likely to be fair before noon, and so continue that day: but if the rain begin an hour or two after sun rising, it is likely to rain all that day, except the rainbow be seen before it rains.

If the last eighteen days of February and ten days of March be for the most part rainy, then the spring and summer quarters will probably be so too: and I never knew a great drought but it entered in that season.

If the latter end of October and beginning

of November be for the most part warm and rainy, then January and February are likely to be frosty and cold, except after a very dry summer.

If October and November be snow and frost, then January and February are likely to be open and mild.

His omnibus ex ingenio suo quisque demat vel addat fidem.

CHAPTER V.

OF THE INFLUENCE OF PECULIARITIES OF
WEATHER ON THE FUNCTIONS OF ORGANISED
BODIES.*

It is generally believed that atmospheric changes have considerable influence on the state

* I may advert, in commencement of these observations on atmospheric disorders of health, to certain sudden cures of violent diseases, said to have been miraculously effected by the invocation of Saints and the BLESSED VIRGIN MARY, by prayers and by other supernatural means, since some philosophers have referred these cures to fortuitous changes in the atmosphere, which may have occurred coincidentally with the pretended crative operations; while others have ascribed them to the physical efficacy of the powerful sentiment of Faith exerted on the body by a mode of sympathetic influence, similar to that whereby the sentiment of Fear causes paleness, Shame blushing, and Hope exhilaration and encreased muscular action. I have introduced these observations in order to confute the above notions, the former of which is not borne out by a reference to Meteorological Journals which I have made; and the latter is unphysiological and totally devoid of all medical analogy. For, though Fear may depress the spirits and cause melancholy and hypochondriasis, though Hope may exhilarate and produce

of our health; and such a belief appears to be founded on reason: for, if a number of persons,

slowly some amendment in nervous diseases, yet we know of no instance in which similar passions effected instantaneous cures of diseases, particularly of such violent and determined local affections, connected with diseased structure of parts, as marked the fortunate subjects of the many miraculous cures, professedly operated in divine attestation of the sanctity of the Catholic Church. When we consider likewise the number and succession of these miracles of various sorts, which are recorded on the testimony of numerous witnesses, from the earliest period of history to the present day, it will appear impossible, agreeable to the doctrine of chances, to suppose that the workers of them, ignorant as they were of meteorology, should, by a fortunate coincidence of events, have pretended to perform them at the precise period of atmospheric changes. Let us only examine the early miracles of Holy Writ, those afterwards recorded by SS Matthew, Mark, Luke, and John, those by St. Francis Xavier, by St. Cyprian, and a host of other Saints and Fathers down to the celebrated Miracle of St. Winefred's Well, to that just now performed at Toulouse, that at Chelmsford last May, and to others of the present day, and we shall find such a regular series of them on record, various in their nature but all having one object and aim, that we must either believe that they really happened by miraculous interposition, or else we must stigmatize, as a league of impostors acting in succession, hundreds of the most learned and pious men of every age of Christianity. Such an opinion, as a learned Bishop observes, would invalidate the strongest proofs of divine inspiration, would tend to destroy the value of human testimony in general, and would consti-

of various ages, of dissimilar constitutions and habits of life, and at different places, become the subjects of disorder at the same time, which appears often to be the case, it is rational to attribute their malady to some general cause then prevailing. And the occurrence of disorder in particular kinds of weather, at particular monthly and daily periods, or at stated seasons of the year, which some persons experience, naturally suggests the idea that such cause resides in the air.

But it appears to me, that it is not the heat, nor cold, nor dampness, nor drought of the air, which is chiefly concerned in producing disorders, nor the sudden transition from one to another of those states; but that it is some inexplicable peculiarity in its electric state, as I have before hinted at in section the seventh. The pain felt in limbs which have been formerly

tute one of the severest libels on human nature ever uttered by any misanthropist whatever. Between these alternatives, I do not presume to offer any opinion of my own, nor would I willingly involve myself in so fearful a dilemma; but having taken the trouble to examine whatever journals of the weather I could get at for years past, I am enabled to say that, at the period of the alledged cures, there were no particular changes recorded, as having taken place in the electricity, heat, weight, or moisture of the air.

broken, previous to a change of weather, and the disturbed state of the stomachs of many persons before and during Thunderstorms, are sufficient, I think, to warrant such a conjecture.*

During what has been denominated unhealthy weather, when medical practitioners have spoken of the general ill health of their patients, I have remarked circumstances which appeared to denote an irregular distribution of the atmospheric electricity. The manner of the distribution, and the continual multiform changes of the Curlcloud, ramifying about and extending its fibres in every direction; the rapid formation and subsidence of the Sondercloud and the Wanecloud in different places, and the irregular appearance of the compound modifications; the intermitted action of De Luc's Aërial Electroscope; strong and varying winds; and the abundance of luminous Meteors by night; are the circumstances to which I allude. A kind of weather too which appears to be remarkably unwholesome is characterised by all the clouds having confused indefinite edges.†

* I must beg leave to refer the reader to my *Observations on Periodical and Atmospheric Diseases*, Underwood, London, 1817.

† In people of what are called nervous and susceptible

A change of wind, particularly a change from any other quarter to East, makes most

constitutions, I have frequently noticed a remarkable variety in the appearance of the hairs on the head: they have appeared, at times, diminished in quantity: at others, superabundant. I have examined them carefully, in each of their states, and found their apparent diminution to consist in the shafts themselves becoming smaller, dryer, losing their tension, and lying in closer contact. I was once inclined to attribute their closer contact to a diminution of their electricity, by which they would become less mutually repulsive: this, however, does not seem sufficient to account for their decrease in size. The shaft may possibly be organized throughout, and its enlargement may be caused by an increased action of its vessels; there may also be an aëriform perspiration into its cavity, on an increase of which it may be more distended: and the increased size and tension of the shaft may result from the co-operation of these two causes. The increased size, strength, and tension of the hair, appear to accompany health, while the opposite state seems to be connected with disorder. The sympathies between the skin and the stomach have been frequently adverted to by physiologists: the skin has been found to be alternately dry and hot, moist and hot, dry and cold, and moist and cold; and these varieties have been attributed to varieties in a state of the stomach, between which and the skin a very direct sympathy is believed to exist. But the varieties in the appearance of the hair do not appear to have been noticed. I have observed, that small doses of mercury have changed the appearance of the hair very soon after their administration. From being flaccid, dry, and small, it has become tense, strong, and moister. Now mer-

people feel uncomfortable, and produces headaches in persons who are subject to them. Similar changes have the most violent effects when they happen about the new or full Moon.

It is difficult to ascertain in what degree the directions and changes of Wind are under the influence of electricity, but there are many circumstances which would incline one to believe that these changes are dependent on some similar principle to that which causes atmospheric diseases in the human body ; for certain Winds, as well as certain changes of Wind, are

cury may increase an aëriform perspiration into the cavity of the shaft, if such an one exist ; it may also rectify a disordered state of the digestive organs, and, by that means, cause a stronger and more healthy action of the vascular system, and of the vessels of the hair among the rest. I think it by no means follows that hairs are not vascular, because we cannot demonstrate their vessels. On this subject, I think, we may reason thus : if all nourishment be effected by the action of vessels, it follows, either that there must be some vessels not nourished at all, or that vascularity must extend ad infinitum. Can we demonstrate those small arteries which ramify in the coats of, and nourish the smallest vasa vasorum ? Such reflections as these ought to prevent our denying organization to any part of a living body, even to the cuticle or the enamel of the teeth. Minute inquiries like these in all the sciences, would end, when pushed to the extent of human knowledge in metaphysical questions like the above.

known to produce epidemics,* in many countries where violent atmospherical complaints prevail. And in every country of the world I believe the East Wind is almost proverbially unhealthy. Casual changes to East produce headache and nervous complaints, and a long continued Wind from that quarter produces an unwholesome season. Another curious thing is, that with East Winds good astronomical observations cannot be made: the luminous objects seeming to dance or wave about in the field of the telescope.

But though we admit the influence of atmospheric peculiarities on our health, yet the manner and extent of their operation cannot easily be ascertained. They may deprive persons, already weak, of a portion of their electricity, and thus the energies of the brain and nervous system may be diminished: or the atmospheric electricity, being unequally distributed in the air, or propagated downward at intervals, it may occasion an irregular distribution of it in our bodies, and produce an irregularity of function. A living animal

* I must beg leave to refer to my *Observations on the Periodical Influence of Atmosphere on Diseases*, and to *M. Mc. Lean's Book on Epidemic Diseases*.

consists, as to its vital parts, of numerous nervous fibres, which give sensitive life, as it seems, to all the parts, and compose different organs of vitality and mind, but these must have some mover.* We do not know that this moving principle is electricity; but it seems reasonable to ascribe it to something in the air; because, deprived of good air, we soon die. It would be vain to inquire into the principle of life; but as air is necessary to its continuance, and as bad injures it; so to some peculiarity in the quality of the air must we ascribe many unknown disorders, even were there not remarkable appearances in the atmosphere at the time of their prevalence. In whatever way the nervous system may be disturbed, a disordered action of the digestive organs will be the probable consequence; and a state of nervous and digestive disorder being once induced, other diseases may insue, to which there may be a constitutional predisposition.†

* See *Somatophychonologia on Body, Life, and Mind, &c.* by *Philostratus*.—8vo. Hunter, London, 1823.

† This part of the subject has been well illustrated by M. ABERNETHY, in his *Surgical Observations on the Constitutional Origin and Treatment of Local Diseases*.—London, 1813. It is difficult in certain states of the atmosphere to

But it would seem that there was a more immediate connexion between the peculiar state of the air, and the kind of disorders which might be thereby excited, than this. For it may be observed, that even of those disorders which are not generally admitted to be contagious, one particular kind will prevail for a long time. Thus, in winter, the different symptoms of that state of body which we call a cold, appear, in some measure, to prevail and vary together; so that it is common to hear people talking of the fashionable complaint. Coughs, for a while, are the prevailing symptoms; then sore throats are the most common. It is in spring that certain kinds of cutaneous eruptions usually appear; and in autumn, that those irregularities in the functions of the digestive viscera, called cholera morbus, &c. happen, besides the many diseases that in tropical climates accompany particular winds or weather. It is possible there may be different states of atmosphere, which act as specific stimuli, and produce their corresponding peculiar diseased nervous actions, having as it were a joint cause,

regulate the bowels, either by medicine, diet, or exercise, so as to effect the desired changes in the Animal Economy.

and being further varied by the particular state of constitution, and other circumstances of the patient.*

Even contagious diseases break out at very uncertain periods, and often without any obvious cause, though they are afterwards evidently propagated by infection. Parts of Turkey are said to be visited by the plague every five or six years, while the same disorder appears more rarely in other places. The small pox rages for a time throughout whole tracts of country; at others, there is scarcely a case to be met with: the same may be observed of scarlitina and measles. I cannot persuade myself that this is merely the effect of accidental introduction. Is it possible there may be some quality in the air, at particular times, whereby it is fitter for the conveyance of infectious matter? Or, can we suppose the effect of a peculiar state of atmosphere to be that of rendering the body more susceptible of infection than ordinary.

In artificial society there are so many causes

* Particular classes of diseases also belong to particular parts of the world. A correct catalogue of liabilities to, and exemptions from, diseases in particular places, would form a useful appendix to Nautical Almanacks and Ephemerides intended for foreign use.

operating to produce ill health, that the extent of the influence of any one can hardly be ascertained. Inactive habits of life, bad air, irritating food, the drinking of spirituous and fermented liquors, the misguidance of the appetites, and the reciprocal operation of the mind and body on each other, have all a tendency to produce disease. But though these various evil habits of artificial life all act to our detriment, their kind of influence may be somewhat different : and in proportion as families, and even nations,*

* In the production of national varieties, local situation is probably much concerned ; and, in this case, the influence of the atmosphere, in their production, does not seem to depend on the degree of heat alone : for not only the colour of the skin and hair, but the form and countenance, and also the diseases of different nations inhabiting nearly the same latitude, vary considerably. The varieties of the soil and its vegetable productions, which constitute part of their food, may have a degree of influence ; and so may peculiarities in the electric state of the air in different longitudes : but there are hordes of savages inhabiting the same tract of country, and living in near neighbourhood, which differ much from each other. And we may add, that among people of the same nation there are scarcely two heads and consequently no two minds exactly alike. It is remarkable, that this variety of figure, of expression of countenance, and apparantly of kind of mind, is increased in proportion as man becomes civilized. The number and variety of its diseases are also

may have indulged, from time to time, in any of them, they may have acquired what are

multiplied by civilization. The effect of civilization in producing variety and disease, is also observable in those animals which have been domesticated. In proportion as they have approached the habitations of man, and lived under his roof and protection, their natural habits have become altered and perverted, the size and figure of their bodies changed and various; and they have, like man, to whom they owe their deformity, become the subjects of numberless diseases. I have dissected many domestic animals, and have often found in them extensive ossifications of soft parts, and preternatural tumours: but I never recollect to have found any marks of organic disease in those which may be truly called wild.

Human nature, from the influence of various causes, having been infinitely varied, and constitutional varieties being in some measure transcendent, every one is probably born with some peculiarity, and, perhaps, more or less, with some particular tendency to disease. Peculiarities of character being afterwards modified and diversified by education, the varieties become almost infinite. The subject of variety leads me to the following considerations. Of all the animated and vegetable beings which inhabit the Earth, no two species are alike, each has its peculiarities. From the concretions of the earth itself, up to man, there appears to be a succession, to use common language, of more and more perfect beings. From saxeous excrescences we ascend to Lichens, and, through all the infinitely various tribes of vegetables, to the Polypus and Star Fish, connecting, as it would seem, vegetable and animal life together. From these every link in the chain appears filled up by numberless animals possessing

called constitutional peculiarities or temperaments ; and the diseases dependent on them may be infinitely varied by the subsequent combination of different evil habits in individuals. For example, sedentary occupations have been considered to hurt our health, by causing an accumulation, or irregular direction, of the nervous energy, which ought naturally to be spent on the various muscles. Thus patients, suffering great and peculiar nervous irritation, have been relieved by a degree of exercise, which, in common cases, would have caused lassitude. The different kinds of spirituous and fermented liquors are, probably, pernicious, by affording

intellect in different degrees, and having infinite peculiarities, till we arrive at man. And in man what infinite variety of organization in different individuals both in kind and degree, from the most complete idiot, whose abject imbecility brings him below the level of a brute, to the most elevated and intellectual character. In ascending the scale of mind, and tracing variety through all its branches, whether we consider that difference which merely arises from the comparative developement of different organs, or that which is produced by all the numberless disorders of body, or by mental insanity, do we ever observe two alike?—All nature is chequered with endless variety of forms, which appear from time to time and are lost for ever, while mutability goes on producing ceaseless combinations.

a stimulus exhausting to the strength; but whether they prove uniformly injurious in proportion to the quantity of pure spirit which they severally contain, or whether the different kinds of spirituous drinks cause different specific actions, is a point which, I think, has never been determined. Doctor Lambe considers animal food and impure water as exhausting stimuli; but he seems to think their respective actions on the system as somewhat different. If they do actually contain deleterious substances, the doctrine about which however seems very vague and inconclusive, their evil influence may be increased, in certain states of disease, by the lacteals losing their discriminating power, and, like common absorbents, drinking up unasimilated or noxious matter, in consequence of a disordered state of the chylopoietic system. In these cases, then, attention to regimen must be particularly necessary. Such a view of the subject as this enables us, in some measure, to reconcile the beneficial effects of vegetable diet on many persons, with the apparent health of others who live chiefly on flesh. To return from the digression into which I have unavoidably been led: those persons are most likely to be disordered by atmospheric peculiarities, who

have the greatest susceptibility of constitution, and, at the same time, the greatest weakness.*

* It appears, that an unhealthy quality in the air, which was believed to excite disorder, was frequently alluded to by ancient writers. So Lucretius—

Nunc ratio quae sit morbis, aut unde repente
Mortiferam possit cladem conflare coorta
Morbida vis hominum generi, pecudumque catervis,
Expedit. Primum multarum semina rerum
Esse supra docui, quae sint vitalia nobis ;
Et contra quae sint morbo mortique, necesse est
Multa volare ; ea quom casu sunt forte coorta
Et perturbarunt coelum, fit morbidus aër.
Atque ea vis omnis morborum, pestilitasque
Aut extrinsecus ut nubes nubulaeque superne
Per coelum veniunt, aut ipsa saepe coorta
De terra surgunt ubi putrorem humida nacta est
Intempestivis pluviis, et solibus icta.

Lucret. de Rer. Nat. lib. vi. 1089.

Again—

Est elephas morbus qui propter flumina Nili
Gignitur Aegypto in media, neque praeterea usquam.
Atthide tentantur gressus oculique in Achaeis
Finibus : inde aliis alius locus est inimicus
Partibus ac membris ; varius concinnat id aër.

De Rer. Nat. lib. vi. 1112.

Which Virgil has imitated—

Hic quondam morbo coeli miseranda coorta est
Tempestas, totoque Autumni incanduit aestu.
Et genus omne neci pecudum dedit, omne ferarum,
Conripuitque lacus ; infecit pabula tabo.

Virg. Georg. lib. iii. 478.

SECTION I.

*Further Observations on the Effects of Atmospheric Peculiarities on the Functions of Organized Bodies.**

EVERY organized body, as far as human sagacity can penetrate, appears susceptible of diseased actions, which may be excited by different causes. In man these causes are various and complicated, and the morbid actions which arise, in consequence, are numerous and dissimilar. And this circumstance may be attributed to his organization and to his mode of life. The influence of the atmosphere, which is one cause, is apt to be overlooked in the human subject, from the variety of others which are continually operating, and

* The attention of various writers at length begins to be revived, and directed towards the study of the atmosphere, and its effects on health. See a Spanish Work, entitled, *Observaciones Sobre el Clima de Lima y sus Influencias en los Seres Organizados en especial el Hombre por el Doctor DON HIPOLITO UNANUE*.—Madrid, 1815.

which, though by their conjoint influence, they predispose to, and often aggravate its effects, have nevertheless a tendency to mislead our judgment as to the manner and extent of its operation.

Animals, particularly those which are domesticated, on which alone we can make any accurate observations, have many sources of disorder, though not so many as man has. They may suffer from hunger, from unnatural food, from fatigue, or from accidental injury, which may produce disease, and which may be the cause of their becoming affected by peculiarities in the air: notwithstanding their comparative freedom from the evils of intoxication, gluttony, and mental perturbation, that prove so frequently destructive to the human subject. The almost simultaneous occurrence of canine hydrophobia in distant parts of the country must be ascribed partly to some peculiarity in the atmosphere; while the circumstance of its occurring primarily only in a few Dogs, would lead us to consider some preexisting, and, perhaps, unnoticed state of disorder in the animal, as conducive to the more violent affection subsequently excited by

the air.* There are many other instances on record of epidemic distempers among animals, which have prevailed only for a time, and which seem to be referable to the atmosphere. A few years ago, in Essex, a mortality prevailed among Cats, which carried off considerable numbers. The mange is said to be contagious; but, if this be the case, it is one of those disorders which arises from unknown causes in a great many animals at once, and may be afterwards propagated by contagion. The same mode of reasoning seems applicable to the glanders of Horses, and to many other distempers of Cattle.

How far electricity may be concerned in all this, it is difficult at present to say; but the discoveries which philosophers are daily making, relative to the extensive operation of this fluid, (for such I must call it, till a better name be

* Virgil aptly alludes to the influence of unhealthy air on animals, though not subject to the general causes of human diseases, namely, wine, gluttony, and mental anxiety.

— Atqui non Massica Bacchi

Munera non illis epulae nocuere repostae,
Frondebis et victu pascuntur simplicis herbae
Pocula sunt fontes liquidi atque exercita cursu
Flumina, nec somnos abrumpit cura salubres.

Virg. Georg. lib. iii. 530.

found,) seem to encourage a suspicion, that its agency is concerned in producing every change in the universe.

SECTION II.

Of the Effects produced by Peculiarities of the Atmosphere on Plants.

Nor only the animal, but also the vegetable kingdom, appears to be affected by peculiarities of the atmosphere, which do not consist in its degree of temperature or pressure. For example, in the summer of 1810, almost all the Plane Trees, with the rough bark or rind,* became diseased in the neighbourhood of London, and for many miles round; very few of which, in comparison with the whole number decayed, recovered so far as to throw forth buds the ensuing spring, while the smoothbarked Plane Trees† and Sycamore Trees‡ remained healthy. The season was not either remarkably hot nor very unusually dry; but there were all those circumstances alluded to in a preceding section

* *Platanus Occidentalis*

† *Platanus Orientalis*.

‡ *Acer Pseudoplatanus*.

as demonstrating an unusual state of the atmospheric electricity. The succeeding summer, that is, in 1811, some of the same species of Plane Trees were again diseased, and a few died. I am informed, that some years ago a similar, though not so extensive a mortality, prevailed among the smoothrined Plane Trees. From hence it would appear, that there were particular states of atmosphere which become specific stimuli to diseased actions of particular plants. Abundant proof of the fact, that particular seasons destroy particular tribes of vegetables, may be collected from gardeners and nurserymen.

A phaenomenon exists in plants which I have never seen fully treated of in any work on the physiology of vegetables, and on which I shall therefore offer a few observations. I allude to the periodical opening and shutting of flowers, and to its particular cause. For example, some flowers are open all day, while others expand only in the evening. There are likewise noctiflorous plants, which close their flowers in the morning.

In the above cases the degree of heat might be alleged as the exciting cause of the expansion of the flowers: but this will not hold good

with regard to other vegetables, which open and shut their blooms at stated hours of the day, or at certain distances of time before changes of weather. In these latter cases we must look for some other cause of the phaenomenon, perhaps to some electrical changes in the state of the atmosphere. In order, however, that facts may precede theory, I shall first notice few of the particular phaenomena.

The *Helianthus annuus* exhibits a phaenomenon which we can most clearly ascribe to the solar rays; namely, that of turning its flowers towards the sun; being directed Eastward in the morning, South at noon, and Westward in the evening. The name of Sunflower has, however, no connexion with this circumstance.

The generality of flowers open at sunrise, and close in the evening.

The Evening Primrose, *Oenothera biennis*, opens at sunset, and closes before midnight.

Most of the syngenesious plants are periodical, and have certain times of day for opening and shutting.

The *Tragopogon pratensis*, or Yellow Goats-beard, opens in the morning, and shuts at noon. The *Tragopogon porrifolius* does the same.

The *Hypochaeris radicata*, *Hieracium Pileosella*, and several others of this family, shut their flowers about three o'clock in the afternoon.

The Four o'Clock Flower is also well known, and is nearly as regular as a watch.

The Pimpernel, *Anagallis arvensis*, does not open its flowers in the morning when Rain is coming, and has become thereby an indicator of the ensuing weather.

Hence there seems to be some particular periodical influence exerted on certain plants in the course of the day, and on others casually, in particular weather. In general I have remarked that the syngenesious and composite flowers are most under the influence of the former. What this influence consists in is unknown; neither has any conjecture been made, unless that of the electric state of the air varying at stated periods of the day; but the phaenomenon should be more attended to; and the question I beg to submit to future observation is:—whether any connexion can be found between the times of these vegetable periods discovered in the phaenomena of plants, and those periods of the recurrence of the paroxysms of ephemeral diseases observed

by pathologists in the animal system when disordered?

This subject might possibly admit of further illustration, from regular tables of the times of the phaenomena, both of Plants and Animals, and of collateral journals of the electrical changes of the air, noticed by means of the Atmospherical Electrosopes, and of M. De Luc's Column.

There are many other facts, which it would be useless to detail, that illustrate the proposition, that there are other peculiarities of atmosphere, besides heat, cold, damp, &c. which affect the functions of organized bodies.*

* It cannot, I think, be considered, that atmospheric peculiarities alone produce epidemic and other complaints, which must be regarded as having a compound origin, and as resulting from the operation of peculiar states of atmosphere on persons of particular states of constitution; otherwise, all persons would be affected, which is contrary to experience. There are, probably, innumerable varieties of temperament, of general habits of life, and of preexisting diseases, which, in different subjects, vary the effects of the air. And many persons, perhaps, enjoy a state of health, and perfect action, which may be capable of resisting its evil influence altogether. It would, perhaps, be productive of useful results, if physicians of extensive practice would make accurate meteorological registers, during the prevalence of any epidemic or contagious

disorders : such as the influenza, which, a few years ago, took a range for some miles round London, but was also prevalent in other parts of the country.

Since writing the above, I have met with some curious observations on the influence of climates, (which correspond, in some measure, with what I have advanced,) in a French work entitled *Rapports du Physique et du Moral de l'Homme*, par P. J. G. Cabanis, 2d edit. Paris, 1805. And I have collected a great index of reference to writers on Periodical and other Atmospheric Diseases, in my Observations on the Periodical and Casual Influence of the Atmosphere, &c. &c. London, 1817. And in the Inquiry into the Cause and Mitigation of Pestilential Fever, &c. 8vo. London, 1818.

CHAPTER VI.

SOME PARTICULARS CONCERNING WINDS.*

WIND has been explained in the following manner. Heated air has a tendency to rise, and cold air rushes in to supply its place. Thus the heated air of the equatorial regions rises, and gives place to a current from the polar regions, which is a process that serves to equalize the temperature of the world. But the polar countries lying nearer to the axis of the sphere, the air from those regions has not received so much motion as that about the equator, or greatest distance from the axis; wherefore it arrives at the equator, where the motion of the Earth is greater. If it had no motion before, an East Wind would be the consequence, and the force of that Wind would be as the difference between the motion of the Earth where the air came from, and that where it arrived: but then it has a motion to the South; for it is rushing into a vacuum, left by the air which rises: so that the Wind will not

* Tables of the comparative number of days in which each Wind blows on an average, may be found in M. Howard's *Climate of London*, vol. ii. p. 155.

be from East, but North East; and the number of degrees North of the East from which it will blow will depend upon the comparative force of the current of air from the North to the difference between the Earth's motion at the equator and at the polar region, from whence the air comes. As there must be a corresponding efflux from the equator higher up; according to this theory, the Wind should every where be North East or South West; but it blows in very different directions at different times and places; and this probably depends on the variations in temperature at different times and places.

To partial rarifications we must ascribe the gales which blow in mountain valleys. I noticed, in traversing the Jura, July 29, 1822, that the Valley Gales were much stronger about half way up, than at the highest parts of the Mountain.

I shall not enter into the detail of the subject, but refer to several treatises written on Winds by different authors.*

* Since the publication of the first edition of this work, I have made many experiments with Balloons, and have observed them always to move in two or more currents, whenever the Wind was not so great as to carry them soon away from sight.

I have lately remarked a circumstance with regard to the change of Winds, which I have never heard mentioned by meteorologists, and which may therefore be worth noticing. I have observed, that when the current next the Earth has changed its direction, it has frequently got into and blown from the quarter from which an upper current had previously blown. I was first apprized of this, by observing the motion of an upper stratum of clouds to be different from that of those which were lower; and by the lower clouds afterwards taking the direction of those above: but as I had few opportunities of observing this circumstance, I thought it merely accidental. Subsequent observations on the various directions of Air Balloons, and the succeeding changes of the Wind, have convinced me that it is frequently the case, that the changes of the Winds begin above, and are propagated downwards. And I have observed this of several successive currents.

Persons who are desirous of making these observations, should have Windvanes accurately constructed, and should compare their indications with those of the clouds above. Weathercocks should be made with a ball of oil at the top, so constructed as to keep dropping into the circular cylinder on which the fan

turns round. I had a Vane of this sort constructed, which had a small bell suspended from the point, so that at every change of the Wind I was apprized of it by the ringing of this little Tintinnabulum, as I sat under the trees of the Elm Grove at Walthamstow; and I could, in some instances, hear the sound when in the house at some distance. I contrived this machine in order to ascertain the sort of gales which might blow, as I found them at times blowing straight and steady, but at others so irregular and unsteady, as to produce a constant horizontal vibration of the fan; the consequence was, that the pointed side of the Weathercock corresponding in its motion with it, the little bell kept constantly ringing. I can safely recommend the use of these sort of Vanes, as they are very accurate indicators of the Wind, when constantly lubricated with oil made to drip into them, and they last a long while without wanting repair. The one above alluded to at Walthamstow, was put up in April, 1817, and is still in good order. But they require good workmen to adjust them. I have since tried many times to get a good Weathercock put up at Hartwell, by country mechanics, without success.

Vanes are of ancient invention, and one of the most perfect was the Aurologium, placed in the garden of Varro; but though so long known, they have never been much improved. At the Exchanges of London, of Lubeck, of Amsterdam, and other great commercial towns, they have indexes in the chamber below where they are fixed, and these indexes are made to move round a face like that of a clock on the wall, the particular Wind being indicated on the dial. The fleche or sagittiform fan is the best shape for Vanes; but almost any preponderance of surface over weight on the side to be moved by the Wind, is enough in moderate breezes to indicate their direction, as we may assure ourselves by observing the cumbersome and whimsical forms of Dragons, Foxes, Griffins, Half Moons, and other capricious devises, which are set up for Weathercocks on steeples and other lofty buildings. When the breeze be very gentle, however, such grotesque Vanes are apt to become useless. The Dragon on Bowchurch Steeple, and the Grasshopper on the Royal Exchange, do not gyrate with those slight movements of the air that impel the Vanes which turn the indexes at Lloyd's, and the Office of the Insurance Company.

CHAPTER VII.

OF ELECTRICITY.

IF we look back into the history of any branch of science, we shall observe, that in the progress of its developement, men have, from time to time, introduced a number of different hypotheses to explain the cause of the complicated phaenomena which they observed; which hypotheses have obtained credit for a while, and have reigned triumphant; but before long they have faded away, from being found incapable of explaining more recently discovered facts, or have been overthrown by others of greater pretensions to credit. From time immemorial, systems of philosophy have mutually overthrown and succeeded each other; and many, which have been rejected by philosophers of antiquity, have been brought into vogue again, under some new dress, by subsequent generations: and thus, in the revolutions of science, systems have alternately decayed and flourished at remote distances of time. Electricity affords a striking example of

this. After the two different electric states of bodies, commonly called the positive and the negative charge, were discovered by certain dissimilarity in their effects,* philosophers began to dispute about the state of those bodies. Some contending that when two different electrics were rubbed together, so as to become electrified, the one gained as much as the other lost of a fluid matter, which they called the electric fluid; and that when, by subsequent approximation, or the intervention of conductors, their electric properties ceased, an equilibrium of the fluid in the two bodies was again restored. While others contended for two distinct fluids, which had a sort of attraction for each other. Upon this supposition, the electrification of two different bodies by friction was a separation of the two fluids, one to each electric, and the equalization was a commixture again, or a distribution of both Electricities through both the electrics. Many plausible experiments and arguments were used in favour of each hypothesis: but the former always obtained the

* For example, the difference of appearance of the luminous star on the point of a conductor, when applied to a body positively charged, from that of the star on the point directed to one negatively charged.

most credit. While Electricians were thus contending, the ingenious I. A. De Luc proposed a system somewhat different from either of the former, an account of which may be found in his works, to which I refer the reader, and leave him to judge of the validity of it by the evidence there adduced. While some philosophers have contended for one fluid, and some for two, others have recently contended for no fluid at all, and have spoken of electrical effects as depending on the agencies of matter. Without dwelling on these adverse systems, which appear, in a great measure, verbal differences, I shall merely observe, that there are certain modes of action of bodies on each other, such as all the phaenomena of artificial Electricity, &c. which custom has ascribed to the agency of a specific fluid. Whatever may be the principle of their action, the daily experience of philosophers shows the extent of this principle. Indeed, recent discoveries and experiments incline one to regard it as the universal agent in all the changes of form which matter undergoes.* A notion of the

* The discoveries made by Sir H. Davy seem calculated to throw light on this interesting subject.

antiquity of which, though it be now newly revived as a subject of philosophical speculation, there appears some traces in the accounts left of the religion of Zoroaster, or the worship of the spirit of fire, as the soul of the universe, the source of all motion and of life.

In attributing the forms of Clouds, the production of Rain, and other atmospheric phaenomena, to Electricity, I would not be understood to involve any particular theory of the mode of electrical action. It is merely intended to ascribe similar appearances to similar causes, and to extend the principle of action upon which the phaenomena of artificial Electricity are explained, which has been identified with that of Lightning, to other atmospheric productions, which, at first sight, are less obviously referable to similar agencies.

I have already, in treating of M. Howard's theory of the modifications, shown how reconcileable that theory was to the various phaenomena exhibited by the clouds. There are many things, however, which I have not yet sufficiently explained, which may be mentioned in this place.

SECTION I.

*Of the Electric State of the Modifications of
Clouds.*

IT is necessary to the present hypothesis, and is indeed conformable to constant experience, to consider Lightning, at least one kind of it, to be the discharge of the electric spark; and yet, at first view, the reconciling the electric charge of the nimbus, which would be necessary to the effect, with its being the result of the union of two dissimilarly electrified clouds, and consequent neutralization of the two Electricities, seems to involve a contradiction. To explain this, I must observe, that after two differently electrified clouds, whose structure and buoyance depended on the similar electric charge of their particles severally, have by a communication and the intense union of the said particles, formed the dense structure of the Raincloud, the latter cloud, when formed, may acquire a strong charge, for it would be thrown into an opposite state to that of the Earth, or other objects over which it might pass, or to other clouds in its vicinity; for its acquiring

again a charge would not cause it to reassume the primitive structure of the clouds of which it was originally formed, for it now was condensed to minute drops of water, a state probably very different from that of any other modification. Under these circumstances, then, the Raincloud may exist as a highly electrified conductor: and it is probable that the difference between common Showers and Thunderstorms consists in the intensity of the charge which the nimbific mass may acquire after its formation.

It must be granted, that though the present theory seems so well to agree with the formation of Rain, it is nevertheless insufficient to account for all the varieties of the other modifications of clouds. We may readily conceive the fibrous structure, and other circumstances of the Curlcloud, to be the result of its office as a conducting body, effecting an electric communication; but we can assign no reason why a strong positive charge should produce a Sondercloud, instead of a collected mass like the Stackencloud, nor under what dissimilar circumstances Electricity should cause the infinite variety of forms under which these modifications, as well as the Curlcloud and

Wanecloud, appear on different occasions. It has been conjectured, that the plane Wanecloud is often placed between two differently electrified plates of air, between which it may be effecting a slow communication; and that the alternate bars of this cloud, at other times, may be interposed between portions of air alternately electrified with plus and minus. Experiments are wanting to ascertain these facts; but, could they be demonstrated, such an alternate distribution of the Electricity of the Air would remain unaccounted for. If the conjecture be true, the streaks of the Wanecloud may perform an office analogous to that of the water interposed between the plates of zinc and copper in the Voltaic Apparatus: and it is a fact, in some measure conformable to this idea, that this cloud, after losing its wavy or its striated appearances, has been observed to condense into a nimbus, and produce Rain without the help of any other cloud, as if it contained within itself the principles of its own resolution into water. The oblique and curved columns of the Wanecloud seem, indeed, hardly explainable even on this supposition. The curious cymoid feature, which so often precedes Storms, is not merely alternate bars, but the bars are

curiously curved, resembling architectural ornaments; a circumstance still more difficult of explanation. Future and repeated observations may, possibly, in the course of time, throw some light on the causes of these varieties.

To return to the Sondercloud: if it really exist with a strong electric charge, and be very retentive of it, the latter circumstance, probably, results from its being surrounded by dry air, which is not a conductor. Conformably to this view, I have noticed the loose indefinite features, which accompany damp air, and appear, in the intervals of common Showers, to be of short duration: and that they have passed to a sort of confused cirrus or cirrostratus, while the dense and compact aggregates, which compose the stormy features, are often of long duration; and I have not observed this dense feature to form itself into Curlcloud and Wanecloud in the manner afore described. The densest nimbi, and the hardest Thunderstorms, often follow the conjunction of this feature of Sondercloud with the other modifications. Another distinction is also worthy of remark: the loose flimsy and transient features of cirrocumulus, often appear above, when cumuli are rapidly flying along in a gale

below; whereas the denser feature more often accompanies a calmer air, particularly the dead calm which precedes a Storm on a sultry summer's afternoon. There are other kinds of cirrocumulus, as I have already mentioned, which attend fine warm weather, which are large distinct and well defined aggregates arranged all over the welkin. To me it is somewhat doubtful what particular kind of cloud Virgil,* Lucretius,† and Pliny,‡ alluded to as being like fleeces of wool, and which accompanied rainy weather: The descriptions of them by the Roman poets, particularly by Virgil in his *Georgicks*, seem to have been imitated from Aratus in his *Diosemeia*, who represented them as signs of Rain.||

* *Tenuia nec lanae per coelum vellera ferri.*

Virg. Geor.

I must refer the reader to my edition of the *Diosemeia* of Aratus.

† *Concipiunt etiam multum quoque saepe marinum*

Humorem, veluti pendentia vellera lanae

Quum supera magnum venti mare nubila portant.

Lucret. vi. 504.

‡ *Plin. Hist. Nat. xviii. 35.*

|| *Πολλακι δ' ἐρχομένων ὑετῶν νέφεα προτάροιθεν,*

Ὅϊα μαλλιστὰ πόποισιν ἑοικότα ἰνδάλλονται.

Arat. Dios. 207.

SECTION II.

Of the Electricity of Thunderclouds ; and of Lightning.

IT has appeared by some experiments, that a Thundercloud exercises its electrical influence on the surrounding air, and throws it into an opposite state : so that if the cloud be positively electrified, there will be a portion of air negatively electrified around it ; and, beyond that, a positively electrified portion perhaps again. But a sufficient number of experiments have not as yet been made with electrometers, to certify whether this be the case with all clouds. It is probable that most of the flashes of Lightning never reach the ground, but are only communications between the Thundercloud and some other either oppositely or not at all electrified.

The hypothesis of Van Mons, that the two different kinds of Thunder and Lightning are the result of very dissimilar causes, that one is the combustion of the gases of water, and the other the discharge of the electric spark, seems wanting in positive proof. Their reports are

certainly different; and mischievous effects generally happen with that kind of which the intonation is single, or of very short duration, and which happens soon after the flash.* But these circumstances may be attributed to the nearness of the cloud to the object destroyed by the Lightning. There are, however, differences in the appearance of Lightning: it looks at some times much brighter, and of a bluer light, than at others. This difference of colour is most remarkable in the vespertine fulgurations in summer; which form the subject of the next section.

I cannot omit to mention one circumstance, which seems rather contrary to my explanation of the differences of claps of Thunder, and rather favours the hypothesis of M. Van Mons, namely, that the two kinds of Thunder often happen, and, indeed, alternate with each other in the same Storm.

The Meteors or balls of fire which occasionally shoot from Thunderclouds during a tempest

* I noticed both kinds in the violent Storm of Thunder and Lightning, in which we were caught while travelling from Gex to Nyon, in Switzerland, last summer, before alluded to. The Storms at this period were mischievous in many and very distant parts of Europe.

are very curious; they would seem to show, if they were proved to be electrical, which they probably are, that similar causes to those which produce Thunder and Lightning may also cause the electrical fire to be embodied in the form of Meteors. A curious experiment to show the embodied form of the electric fluid was made by MM. Arden and Constable. Refer to Bertholon Elect. Met. vol. ii. p. 27.

SECTION III.

Of Silent Lightning.

THE silent Lightning of warm summer evenings seems sometimes to come from visible clouds; but, at others, flashes of great latitude appear almost all around the horizon, when no cloud can be seen. These may either be the effect of clouds too distant to be observed, or they may be communications between the damp Earth and the hazy Air above. The most remarkable thing is their always being seen in the horizon. When there be definite clouds about, then are the flashes the brightest; a circumstance which looks as if the flashes which

appear without clouds were only at too great a distance for the clouds from which the flashes come to be seen. In either case the communication may often be with the ground, which, in the damp of the evening, with falling dew, would not be violent, as the general moisture would afford a more free and latent, and, consequently, a more gentle passage to or from the Earth.* Upon this principle, we may see also why nocturnal Storms are generally less mischievous than those which happen in the day time, and why there is additional security in Thunderstorms after the Rain has begun to fall.†

* The Abbé Bertholon thought he could determine when the Lightning rose from the ground to the cloud, and when it descended from the cloud to the ground. *Bertholon, Elec. Met. vol. i. c. iv. p. 132.* He refers to a letter of Maffei, *Della Formazione del Fulmine*, in the *Journal de Venice*. Tom. xxxii. art. 7.

† This ought to suggest the propriety of keeping the ground about the place of insertion of the Metallic Conductors, or Lightningtraps, as they are called, moistened with water, to effect a freer entrance of the fluid. The Pointed Conductors are the most useful.

SECTION IV.

*Of the Aurora Borealis or Northern Lights.**

AFTER the attention of philosophers began to be directed to the Atmospheric Electricity, the Aurora Borealis and Australis, commonly called the Northern Lights, were considered as electrical. There appear, however, to have been several different explanations of this phaenomenon.

Franklin regarded the coruscations of Northern Lights as the result of a slow and continual discharge of electric fluid from the atmosphere about the poles to the air above; and Sir H. Davy, and also many other Electricians, have noticed the striking similarity between those lights, and Electricity discharged through rare air.†—These Auroras are said only to happen towards the poles, and in high latitudes where alone there can be a continual coating of Ice and Snow, to prevent the electric

* *Aurora Polaris* would be a better name; as it is not confined to the Septentrional regions.

† Refer to Davy. Elem. Chem. Philos. vol. i. p. 141.

communication from taking place between the Earth and the Atmosphere above. But this assertion as well as its explanation is quite unfounded. Appearances similar to Northern Lights are seen in low latitudes occasionally, an instance of which I witnessed on Monday the 4th of December, 1820, at Hartfield, in Sussex. About six o'clock in the evening, several luminous phaenomena, resembling the reflection in the sky of large but distant fires, appeared in the N. and N. E., and were distinctly seen by other persons on several subsequent nights.—Refer to the Calendar at the end of this work.

The Aurora has been explained by supposition that the Earth may have electric polarity; and the correspondence between the centre of the Aurora and the magnetic poles, which has been asserted, is a circumstance very worthy of future consideration, as it tends to establish more certainly the connexion between Electricity and Magnetism, of which M. Benjamin M. Forster's new and interesting experiment affords a further proof.*

* Mairan, in his *Traité Physique et Historique de l'Aurore Boreale*, 4to, Paris, 1754, observes that it resembles what is called the zodiacal light; and supposes that they are both emanations from the Sun. In the work above alluded to,

SECTION V.

Of several other Electrical Phaenomena.

To the above described electrical phaenomena may be added several other dissimilar appearances, referable to the same principle, operating under different circumstances. Waterspouts probably result from the attraction of a nimbus for the water over which it may be, whence both are violently drawn towards each other till they meet:* and when the Electricity of the cloud has been equalized with that of the water, the column comes down. Though this effect is, to a certain degree, explainable on this supposition; yet, as, in other instances, the

* A friend of mine calls this contact of the waters from below with those from above, Neptune shaking hands with Jove.

many curious accounts and figures of the Aurora may be found. For further accounts, consult Phil. Trans. Also Bertholon, Elec. Met. vol. ii. p. 49.

Since the publication of the first edition of this book, the phaenomenon of the Aurora Borealis has again attracted the notice of meteorologists in this country; but they have neither been so grand, nor so frequent as formerly.

particular circumstances under which this rare phaenomenon takes place, are as yet obscure.

Cavallo attributed the fiery Meteors described in another place to Electricity. As I have already spoken of these phaenomena, it is unnecessary to add much more. I only observe, that there is this difference between Meteors and electric communications, that the former occupy some time in their passage, whereas electric communications are instantaneous; that is, they take place in no perceivable time.*

The variety too in the composition of the light of Meteors, their scintillations, and the prismatic colours sometimes observed in the tails of the larger sort, are circumstances which do not appear to me analogous to any known electrical phaenomena.

Dr. Blagden, in the *Phil. Trans.*† observes,

* There is this difference in the motion of the brilliant and larger kind of Falling Stars or Meteors, and the other two kinds, which I have called the stellar and the caudate. The brilliant Meteors of summer evenings have sometimes a curvilinear motion; whereas the other two sorts always move nearly straight: though as far as I can observe, with different inclinations to the horizon, on different occasions.

† *Phil. Trans.* lxxiv. 208. Some observations on geometrical measurement, by means of observations on Falling Stars, are recorded in the *Phil. Mag.* for 1822.

in proof of the number of blue rays which entered into the composition of the light of the great Meteor of Aug. 18, 1783, that the Moon appeared at Brussels quite red, during the Meteor's passage, from the contrast of light.* I have noticed this reddish appearance of the Moon during the combustion of many substances which burn blue, in pyrotechnical exhibitions. In the tail, and in the separated scintillations of the aforesaid great Meteor prismatic colours were observed very variously, by persons in different places.

These appearances seem certainly to favour the hypothesis of M. De Luc, as I have before observed, rather than any mode of explaining them on the known laws of Electricity.†

* Dr. B. refers to a letter of Abbé Mann to Sir Joseph Banks.

† Some have considered Shooting Stars as bodies projected from the Moon, and ignited in their course. In this case, the peculiarities of their light, at different times, might be caused either by the quality of the air in which they burned, or by the quality of the ignited body. Meteorolites, too have been considered as similarly projected from the Moon, and have thence received the appellation of Lunar Stones. And this opinion has gained support by their analysis, which does not correspond with that of any known terrestrial compound. Biot, in his *Astronomie Physique*, and La Place, in his *Sys.*

During Thunderstorms however Meteors occasionally come down like Fireballs which sometimes seem very like those described

du Monde, seem rather of this opinion. The altitude of what are called Falling Stars, above the Earth's surface, has never been well ascertained, though it might easily be done by geometrical observation ; at least, in many cases, where the Meteor could be identified, as seen in different places. They are not seen below clouds ; and, indeed, none, except the larger and brilliant kind, are usually observed when there are many clouds about : but this may arise from the state of the atmosphere necessary to their production being incompatible with the existence of much cloud. M. De Luc mentioned to me his having seen them from the top of high mountains, and that they then appeared at a very great distance. From observations which I have made, they certainly vary in the height, as well as the length, of their course. It is not impossible, but that if Meteorolites were observed to fall at night, they might be always found to be accompanied by some fiery phaenomenon of this kind. The almost horizontal motion of some large Meteors, would be no objection to this hypothesis, if they always moved from E. to W. or nearly so ; as, when they came into the sphere of the Earth's attraction, their motion might be spent, and they would then receive an apparent motion compounded of the opposite of the Earth's rotatory motion, and the attraction to the centre. An analysis of several meteoric stones may be found in Sowerby's Brit. Mineral. vol. ii. p. 18. A catalogue of many of them, and of the places where they fell, was made and published in France ; there are also many accounts of them in several numbers of the Philosophical Magazine.

above. And the electric Stars or balls of fire called Fires of St. Elmo, which alight on the masts and rigging of ships at sea before Storms, seem certainly referable rather to electric sparks of some sort than to burning gases.

There are several dissimilar appearances, which may be mentioned in this place, as subjects worthy of the future investigation of natural philosophers, which seem referable to Electricity: and which appear to hold a middle nature between the Fiery Meteors above described, and known electrical phaenomena. There are, occasionally, stationary Meteors, simple Accensions, which appear in cloudy Skies, and last scarcely a moment. There are also luminous portions of clouds occasionally, of less intensity of light, which are faint and glimmering, like luminous nebulae; and others, which have a rapid motion, that may be said to have the same relation to moving Meteors above, which the pale light about plants, before noticed, bears to the well known phaenomenon which occurs below called the Ignis Fatuus, Jack with a Lantern, or Will with a Wisp, the power of which to lead astray the benighted traveller into boggy quagmires, by presenting the appearance of a moving lantern, is well

known, and of which many curious stories are recorded.*

SECTION VI.

Of the Electricity of the Air.

WHAT has hitherto been said of the Electricity of the atmosphere, related chiefly to that of clouds. In serene weather, however, and in the absence of all clouds, the air has shown signs of being electrified, by means of kites raised in the air, and other electrometers.† That air should, at different times and places, have positive and negative charges, is not at all surprising; but the circumstances under which such charges have taken place do not appear to have been sufficiently attended to.

* “She was pinched and pulled, she said,
And he by Friar’s Lantern led.”

Milton.

The late M. Edward Forster mentioned to me that this phaenomenon used to be common in the marshes between Walthamstow and Tottenham, but it has now disappeared there.

† See Becaria Elec.; also Cavallo Comp. Treat. Elec. Letters of Abbé Nollet, in Phil. Trans. &c.

During very clear weather, the air has generally been found to have a positive Electricity, and the exceptions to this rule have generally happened when either a strong Wind has blown, or when there have been clouds in the vicinity of the electrometer. That large electrified clouds throw the surrounding air into an opposite state, has already been stated; and some circumstances have induced an opinion, that there are alternate portions of air with different Electricities round the electrified clouds. And it becomes a question for future solution, whether, when air is found electrified positively, there be not a counter charge somewhere else? Possibly the whole Atmosphere, and the Earth too, may have electric polarity. That the electric state of the atmosphere varies much at different times, is beyond a question, from the facts above stated; but the causes of its irregularities, which, in fact, involves the causes of clouds, &c. is as yet a mystery. There have been found alternations in the electric state of the atmosphere, that is, rapid changes from a positive to a negative state, and vice versa. These circumstances were observed near the Appennines, when a strong Wind blew, and when clouds hung about the tops of those

mountains, described as having rectilinear spouts at the top, and which, from the description, I take to be a kind of cirrus.* Other clouds appeared at the time, which, by the account, appear to have been dense cumulostrati and cumuli. As irregularities in the electric state of the air may be concerned in the production of many disorders of health, the investigation of them becomes additionally interesting. It is much to be wished, that those who have opportunities of making experiments with electrical kites, &c. would attend to what is the general disposition of the clouds, which prevail during different states of the atmospheric Electricity. An instrument likely to throw some light on this subject has been invented by M. de Luc, described in the next section.

* Clouds of this kind, attaching themselves to the tops of high hills and mountains are noticed by Saussure as being called *les nuages parasites*; and considered as portending Rain. Refer to Saussure, *Voyage dans les Alpes*, § 2070, and M. Du Carla in *Journal de Physique* for 1784. Homer. *Iliad*. v. 522. Theophrastus, *De. Sign. Temp.*, and Aratus, *Dios*. 188.

SECTION VII.

*Of M. De Luc's Aërial Electroscope, and the Connexion observed between its Action and other Atmospheric Phaenomena.**

It may not be improper to present the reader with a short account of M. De Luc's Electric Column, or Aërial Electroscope, as this instrument has been frequently alluded to in my Journals.

It is composed of a great number of small circular and very thin plates, about the diameter of a sixpenny piece of silver, of paper and of zinc, alternately arranged, forming a column; the two ends of which are made to approximate, and at each of them is attached a small bell; a metallic clapper is then hung between them, and the whole apparatus is insulated by being fixed on glass stands. One end of the column is observed to become electrified *plus*, as it is termed, and the other *minus*; consequently, one of the bells becomes electrified *plus*, or positive,

* See Letters of M. De Luc on this Column in many numbers of Phil. Journal, and in Phil. Mag. the present month, Oct. 1814, p. 248.

and the other *minus* or negative: and the metallic clapper moving rapidly from one to the other, to equalize the two electricities, a pulsation is produced, and the bells ring. Neither the heat or cold, dryness or moisture of the atmosphere, appear to have any considerable influence on the action of this instrument; but it is considerably altered by peculiarities in the electric state of the atmosphere. The prevalence of cirri ramifying about the sky in various directions, and accompanied often by other modifications, by dry easterly and changable winds, and by numerous small meteors of an evening which appear to indicate a disturbance in the atmospherical Electricity, I have noticed to be accompanied by an irregular action of the Electric Column of M. De Luc; the bells ring at intervals, and with a kind of hurried pulsation. When such weather as I have described is followed by Rain, the bells have been found silent. There are also other varieties in the kind of pulsation of the bells; sometimes they ring weak and regular, sometimes weak and irregular, sometimes strong and regular, at others strong but irregular; the intervals of quiescence are sometimes of longer duration than at others. These minute variations are probably connected with peculiarities in the

state of the atmosphere, as I have said above, which are worthy attention, because they may be principally concerned in producing many disorders of health which are attributed to atmospheric influence: when the weather is settled, when only diurnal cumuli prevail with Westerly Winds, then the action of De Luc's column is the most regular; and this is found to be the most wholesome kind of weather.*

Since the publication of the first edition of this book, I have seen the superb columns made by M. De Luc, himself. The varieties of the action seem to correspond with my own observations on the instrument belonging to M. Benjamin M. Forster, of Walthamstow, which continued ringing with varied action for a year, and which received the whimsical appellation of the Perpetual Motion, or the Jubilee Bells, because they happened to begin to ring on the Anniversary so called in honour of the 50th year of the Reign of the late King.

M. Benjamin M. Forster has lately discovered another very curious fact, which shows the connexion between Electricity, Galvanism, and Magnetism, an instrument to demonstrate which he has already described.

* See Phil. Mag. June and July, 1811.

CHAPTER VIII.

FURTHER INVESTIGATION OF PECULIARITIES
OF WEATHER.

IF it can be shown, as above, that there are varieties in the state of the atmosphere, with which the prevalence of disease seems conjoined, so that the said diseases may be referred to its agency, analogy would lead us to ascribe other diseases, for which no particular cause could be assigned, to some other peculiarity in the air, which, however, might not be demonstrable by any meteorological instruments: and our inquiries will be directed to discover in what such peculiarities may consist. I have already shown that the peculiarities of weather alluded to as being accompanied by the great prevalence of disorders, do not appear to consist in the dampness, dryness, heat, cold, levity, or gravity of the atmosphere, nor in the combination of any two or more of these, or any other qualities of the air, demonstrable by meteorological instruments; but that, in many instances, they appear to be marked by the peculiar character and

distribution of the clouds, and the appearance of other Meteors; the relation of which to the state of the Thermometer, Barometer, and Hygrometer, have not been duly noted; that is to say, there has been no discoverable peculiarity in the state of those instruments at the time: but the actions of De Luc's Aërial Electroscope have been intermitted, or otherwise irregular and inconstant.

As the peculiarities of weather alluded to are characterised by difference in the distribution of the clouds in general, and of other Meteors, and do not consist in the varieties of any one cloud in particular; and as the former part of this work has related chiefly to the varieties of individual modification, it is purposed to consider briefly, in this place, the characteristic circumstances of different kinds of weather. In doing this, I have taken examples of some of the most dissimilar varieties, though there are kinds of weather partaking more or less of each of them, so that the shades of difference are innumerable, every day, perhaps, having something different from all the rest in the year: and if the different states of weather alluded to have any decided connexion with the varieties of the animal functions, their

effects must be very intricate and compound; a circumstance which has always rendered the knowledge of this connexion so obscure and imperfect.

As there are many circumstances which constitute particular kinds of weather, and many combinations of these circumstances, it will be proper to adopt some one as a criterion, and speak of the combinations of the others under that head.

The order of the clouds is the most obvious feature in different kinds of weather, and ought to be principally attended to. There are several sorts of weather, which, to an inattentive observer, would be called, in common, fine wholesome weather; but which, by a more minute observance, are found to differ materially, both in their appearance and consequences.

A stratus early in the morning, greater or less, according to the time of year, &c. evaporating as the Sun rises, the formation of well defined hemispherical Stackenclouds through the day, most abundant soon after noon, and disappearing again in the evening, to be succeeded by strong Dew and a Fallcloud, are the circumstances which mark a settled and wholesome state of the

Atmosphere, particularly when accompanied by Westerly Breezes; which though they do not vary directly as the Sun's altitude, yet seem, in some measure, to keep pace with it, and a calm succeeds in the evening.

This order and distribution of the clouds happens with different Winds, and different states of the Thermometer; for it is not confined to hybernal frost, nor to the heat of the Dog Star. When it takes place, however, the mercury in the Barometer is seldom very low or variable. Indeed it may be said, in general, to be conjoined with a mean state of that instrument. This weather is of longer or shorter continuance, as may happen: the appearance of cirrus and cirrostratus, and above all, the fleecy and irregular look of the cumuli, with sudden variations in temperature and pressure, indicate a change. Sometimes these appearances soon subside, and the same weather returns. The cumuli, too, occasionally become rocklike, approach to cumulostratus, and spread, without ending in Rain; but these are exceptions to the general rule. When to such a continuance of regular nimbification, as described above, cirrocumulus supervenes, an increased warmth often follows, and frequently without Rain.

Occasional changes of this kind in the order of the clouds, unattended by Rain, took place during the long drought, which continued from Midsummer nearly to Michaelmas, in the year 1800.

In days with the regular order of clouds alluded to, I have found the action of De Luc's Electric Column regular. Such days often alternate with others in which different modifications appear; and very often after, cumulostratus, accompanied by cirrus, &c. has prevailed for many days: nimbification and Rain take place; after which, only regular cumuli are observed again; as if nimbification was a process which restored the tranquillity of the Atmospheric Electricity.

In spring and autumn we have frequently a continuance of cloudless days, ushered in by more or less of a stratus; but this very clear kind of weather seldom takes place about the solstices. The Wind is usually Easterly, varying more or less to North or South, and often strong: the air dry; the mercury of the barometer usually above the mean altitude; and the range of the thermometer, that is, the distance between the maximum of the day, and the minimum of the night, is considerable. The

falling of the Dew in the evening, which is often plenteous, is indicated by the crimson or lake colour of the horizon for some time after sunset, which extends all around, except perhaps, in the West, where the Sky has a deep and rich golden appearance, approximating more to red, to yellow, or to orange*. Nearly a week of

* It is very difficult to commemorate precisely the particular tints exhibited by clouds; yet this ought to be done as accurately as possible: for the different colours, refracted by the haze, with a horizontal Sun, are very various, on different occasions, though the Sun's distance from the horizon, either above or below, shall be the same. The haze, at different times, refracts almost every conceivable variety of purple, lake, crimson, orange, and yellow, and sometimes a brownish colour. The colour of the haze should be distinguished from that refracted by definite clouds. The latter also refract a great variety of colours, and sometimes many tints are seen in different parts of the same cloud. Though the infinite shade of colours will ever prevent the adoption of terms which shall define them precisely; yet a much better nomenclature for colours might be invented, than has hitherto been done. It is obvious how indefinite the present terms in common use are. How different the red of the *Pœony* from that of the *Papaver Rhæas*, and still more so from that of the *Papaver Orientale*, or the *Scarlet Lichnis*. The yellow of the *Crocus*, or the *Marigold*, from that of the *Evening Primrose*, or the *Ranunculus pratensis*. Perhaps the best mode of forming a nomenclature for colours, would be by reference to specific flowers, which may be considered as standards.

such clear weather happened during Sept. 1811, and afforded a good opportunity of making observations on the brilliant comet which was conspicuous that autumn.

A fine line of cirrus, of great altitude and length, is often the first sign that the clear weather above described is about to be changed for an atmosphere more variable; and in proportion as such kinds of cirri increase, and others, or clouds of other modifications, succeed, we may judge of the nearer or more distant approach of the alteration; and the weather about to follow may, in general, be determined by the general face of the Sky, and of the kind of modifications apparent during the progress of the change. But the great clearness above depicted often gives place to, and alternates with a state of the atmosphere marked by peculiar circumstances, which seem to indicate a great disturbance, and perpetual change in its electric state.

In such weather, the Curlcloud generally appears soon after, and sometimes before, Sunrise, and prevails through the day, under every conceivable variety of whimsical figures. Comoid tufts, like bushes of hair, or sometimes like erected feathers; angular flexures; streaks;

reticular intersections of them, frequently at right angles, which look like nets thrown over the firmament; forms of arrows; stars with long fibrous tails; cyphon shaped curves; and lines with pendulous or with erect fringes, ornament the Sky; still different appearances of stars and waves again appear, as these clouds change to Sondercloud and to Wanecloud, which modifications also seem to form and subside spontaneously, in different planes,* and with the varied and dissimilar appearances of flocks at rest; fleeces of wool, or myriads of small specks; of long tapering columns, like the tail of the great Manis, or of Mackerelback Skies, or of striae, like the grains of wood. Cumuli have not now their hemispherical figure; tuberculated, or fleecy; elevated and flimsy, or heavily sailing along like scud, they appear operated on by an unusual condition of their causes. All these circumstances, when viewed as perpetually changing and appearing

* Clouds are said to be in the same plane, when at equal distances from the Earth; more properly, it is a portion of a sphere, whose diameter is greater than that of the sphere of the Earth, by twice the distance from the Earth's surface to the cloud. We speak familiarly of the plane surface of water, which is actually spherical.

at different times of day, and exhibiting innumerable and dissimilar tints, according with the Sun's varying altitude, afford abundant amusement for the speculative observer, who delights in the highly diversified scenery of nature. But when we observe the relation of such multiform configurations of the clouds to other phaenomena, the varying and irregular action of De Luc's Electroscope, the irregular strength and duration of the Winds, the altitude of the mercury in the barometer, and to the state of other instruments, our curiosity is enhanced; and our desire further to develop the principles of such relations becomes yet of more moment, when we find atmospheric peculiarities, of which such appearances are tokens to influence the growth of vegetables, and to affect the functions of animal life.

The kind of weather above depicted continued through the chief part of the autumn of 1810, during which time such derangements in the action of the digestive system, as are commonly called autumnal diseases, were remarkably prevalent, followed by hypochondriasis, and other nervous affections. It was in the same season that the great mortality happened among the Plane Trees above alluded to. The weather of

the said autumn was rather hot and dry, till about the middle of October, when it became damp, and rather rainy: but still there continued to be an unusual appearance of the clouds during the intervals of fine weather. A similar kind of dry weather occurred again in the spring, 1811, attended with similar phaenomena, and the irregular action of the Aërial Electro-scope. But the summer and autumn following were remarkably fine and wholesome, and very warm, though there were occasionally days in which similar multiform and ever changing configurations of the modifications prevailed. Even showery weather is characterized by very different appearances of the clouds at different times. The stupendous and mountainlike cumuli and cumulostrati, which appear in the intervals of summer Showers, have a different look from those which accompany the cold Snowshowers of spring, with keen March Winds. Indeed, the rocklike Twainclouds, which are seen before such Snow, have generally a well defined, though rugged margin, to appearance, and a peculiar look of transparency, or clearness, which is preserved even when they become dark purple, or nearly black.

With such Skies, I have known cold South Winds; and on other occasions, with different kinds of clouds, hot Northerly Winds in spring. The peculiar appearances which attend these exceptions to the usual coincidence of phænomena ought to be particularly attended to.

I have slightly mentioned these circumstances, from a belief, that in general the particular order and arrangements of the clouds are not sufficiently attended to. It is to be hoped, in future, that more attention will be paid to this part of the subject.*

* There are many minute differences in the appearance of the clouds, under different circumstances, which I have not described, as every meteorologist must have observed them for himself. Sometimes there is a wavy appearance of the under part of a cumulostratus passing over, which looks like the white foaming billows of the Ocean. This is generally a symptom of variable weather, as is also the curling inward of the fleecy protuberances of the cumuli, as they pass along in the Wind.

I have often thought it worth while to examine whether the clouds did not present a different appearance, according to the quarter from which the Wind blew, independent of any other circumstance. The most varied and multiform Curleclouds are certainly to be seen spread aloft in a calm region, while Eurus is breathing his bitter and unwholesome blast below; and the most regularly formed Stackenclouds are those which are wafted along by the Zephyr's musky

wing in fair summer weather, and which increase with the ephemeral temperature, and cloud the brows of day. The colours likewise of the Haze and of the Clouds depend greatly on the direction of the Wind, the most brilliant certainly attend East Winds, and form some of the glowing tints so beautifully imitated by Claude Lorraine, and other painters of natural scenery. It is with those Winds that Aurora rises blushing at her golden tresses. And it is usually a Southern Wind that makes Greyhooded Even like a sad Votarist in Palmer's weeds.

CHAPTER IX.

SOME MISCELLANEOUS OBSERVATIONS ON ATMOSPHERIC TEMPERATURE AND PRESSURE.

AFTER the invention of the Barometer and Thermometer, many important discoveries, about the Pressure and Temperature of the atmosphere were made by philosophers. The knowledge, however, of their variations, and the relations of these variations with other phaenomena, remains still very obscure, and leaves a wide field for future investigation.

When Galilaeo and Torricellus had discovered that the Pressure of a column of atmosphere was equal to that of a column of mercury of equal base, and of about thirty inches of height, and to a column of water of the same base, and about thirtyfive feet in height: but that the height of the mercury or water, which balanced the column of air, varied a little at different times, philosophers began to measure the atmospheric pressure by such means; and finding that its variations were very irregular and uncertain, and were not referable to any known

laws, they began to investigate their causes. Without detailing the particulars of the observations made by philosophers, from time to time, it will be sufficient to observe, that the variations of pressure, as far, at least, as we can discover, may be caused, first, by a variation in the volume of atmosphere, the density remaining the same; or, secondly, by a variation of density, the volume remaining the same: or, lastly, by a variation in both density and volume. But though these circumstances may be conceived capable of effecting barometrical variations, yet it is probable there may be many other causes yet unknown. Many hypotheses have been assumed to account for variations in the density and volume: but after all, these do not seem capable of accounting for all the phaenomena which attend alterations in the atmospheric pressure. As it is not my intention to detail former experiments and hypotheses, I shall conclude this chapter with a few simple observations on facts, which I have made myself, many whereof do not appear to have been noticed before.

It is a common observation, that the falling of the mercury, when gradual, is followed by long continued Rain; when it suddenly sinks, or

sinks and rises alternately, by Showers; and when greater or more sudden depressions take place, Storms are generally the consequence. These observations are, generally speaking, true; though, perhaps, with occasional and rare exceptions; for sometimes the Barometer shall sink, and even the clouds present all the appearances of Rain, and yet the rainy symptoms shall subside, and clearness return without any fall. But there appear to me to be some other remarkable connexions between the state of the Barometer, and other phaenomena, which do not appear to have been noticed.

Sudden changes in the barometrical pressure of the air produce certain corresponding effects on the nervous system: thus a rapid rise in the Barometer will generally cause a peculiar sensation in the ears of many persons amounting to a degree of temporary deafness; and what renders it more strikingly apparent, that the increase of atmospherical pressure is the cause of the sensation is, that a sudden descent from high mountains has often the same effect, as I experienced myself after coming down from Cader Idris, Aug. 14, 1814, and again after descending from Skiddaw, May 19, 1816. I perceived it also in a less degree during the

gradual descent from the Jura into Switzerland, on Monday, July 29, 1822. Aëronauts have frequently become deaf for a time after rapidly descending in Air Balloons, and this effect seems, according to accounts, to be in some measure proportionate in a degree to the height to which they have ascended.

Some writers have ascribed the above phaenomenon to the relaxation of the tympanum, but to me it seems clearly referable to determination of blood to the internal parts of the ear, and to be a similar impulse of blood to those which we find often to follow nervous irritation in any part or organ.

Rain, as is known, sometimes falls with a rising Barometer; and, when this happens, it is usually followed by fine healthy weather. Some philosophers have called it Rain of the recombination of the air.* And I have noticed Rain, with a rising of the mercury, to be attended with circumstances which seem to indicate a strong positive electricity.†

* Van Mons. Nicholson's Jour. Sept. 1809.

† The strong and refreshing smell, which sometimes results when Showers first fall, after a long drought, is not an invariable attendant on them, even under these circumstances. The highly electrified water of summer's Thundershowers

We have usually a warm and agreeable sensation of the atmosphere with such Rain, which is strikingly contrasted to the cold and raw sensation occasioned by the fall of thick wet mists, or Rain which happens when, even with a Northern or Easterly Wind, the Barometer and Thermometer sink together, and when the air has previously been found to be either negatively, or nonelectrified.

As far as we can determine, the air appears capable of holding more water in solution, in proportion as its temperature and pressure is greater; and yet the Thermometer often rises when Rain is coming on, particularly in winter. This circumstance is not wholly irreconcilable with what has been laid down, since the Rain may be occasioned by a diminution of pressure, as is often manifestly the case, the Barometer falling, or else by a supervening current of colder or supersaturated air; and the rise of the Thermometer, which accompanies the fall of the Barometer in this case, may be owing to the increase of temperature produced by the con-

produces this smell the strongest; and it is weakest with the cold, and, perhaps, nonelectric Rain, which sometimes falls after the condensation of a spreading sheet of cirrostratus into nimbus, with a cold atmosphere.

densation of the vapour in the case of Rain. But on what principle can we account for the increase both of Temperature and Pressure, during such condensation? On the 20th and 21st July, 1811, Rain kept falling in large drops almost all day, with a rising Barometer, and no depression of Temperature, (making allowances for the interception of the Sun's rays,) while evaporation continued to be considerable.

It has been remarked by M. Howard, that if the state of the Barometer, during any period of the Moon, be examined, it will be found to have been highest or lowest about the time of the Full and New Moon, as may happen; but that the mean state of that instrument usually happens about the lunar quadratures. As far as my own observations enable me to decide this connexion is observable in the majority of instances.

I once thought that the mean state of the Barometer of a given number of day's observation varied, in some measure, according to the Moon's perigee and apogee; that is, that it was higher with the latter than with the former: but subsequent researches convinced me, that the exceptions were almost as numerous as the cases corresponding to the rule.

There is yet another observation on the Barometer worthy of record. It is said, that if a number of daily observations be taken, the average maximum for any period will be found to take place at noon, and the minimum at nine o'clock in the morning, and the next lowest at six in the evening.

I introduce the above circumstances here, merely that they may become the subjects of the future observations of meteorologists in different places; as I think they are worthy of stricter examination than has hitherto been made.*

* If the place of the Moon has such an effect on the atmosphere, as to influence the barometrical pressure, it may probably produce other varieties in the state of the air, which may influence the nervous system and animal functions of persons in particular kinds of disease. It is thus that it may have an effect on persons of such deranged intellect, as is termed lunacy, who are said, in some cases, to be worst about the full of the Moon.

There are many other instances of periodical paroxysms of different complaints, and some of them very curious; but how far, and in what manner, solar and lunar influence is concerned, cannot be precisely determined. Some persons have had paroxysms come on at particular hours of the night, and have, for a long time, awoken at those hours. To try how far the imagination has been concerned in producing the diseases, clocks have been altered to deceive the patient, but

without avail. The reader may consult the *Zoonomia* of Darwin, and a recent work in France, by Ph. Pinel, Arnold on Insanity, Crichton on Mental Derangement, and others who have written on this subject.

Since the first edition of this book, I have conversed with Dr. Spurzheim, about the periodicity of disorders of health. He considers it as more or less affecting every body. The reader may refer to a large work on the newly discovered Anatomy and Physiology of the Brain, published by him, entitled, *Physiognomical System, &c.* 8vo. Baldwin & Co. London, 1815.—Also *Observations on the Casual and Periodical Diseases ascribable to Atmospheric Influence*, 8vo. London, 1817.

CHAPTER X.

OF SEVERAL SUPERSTITIOUS NOTIONS WHICH
APPEAR TO HAVE HAD THEIR ORIGIN IN AN
OBSERVANCE OF CERTAIN METEOROLOGICAL
PHAENOMENA.

A NATURAL tendency exists in the human mind, arising from the mutual influence of the different organs of the Brain, and the consequent association of ideas, to attach notions of good or evil to those objects which have been observed to precede or to accompany pleasurable or painful circumstances: hence the origin of many superstitious opinions.*

From such association of ideas many animals were anciently worshipped, either as gods or evil spirits; and even at a later period, when their worship was rejected as superstitious, or useless, they were considered as foreboders of

* In the figurative language of the ancients, facts were often ascribed to contemporaneous remarkable circumstances; hence the influence of Procyon or Dog Days, the blustering of the stormy Orion, and many others; see a *Memoir Sur l'Origine des Constellations et l'Explication de la Fable*, by M. Dupuis.

evil or of good. Many of these superstitions originated in the observance of facts, ascribable to atmospheric influence.* Thus, certain birds being affected by peculiarities of the air, previous to Thunderstorms, or other terrible events, and showing signs of their affections by particular habits, were found to be foreboders of tempests, hurricanes, and other dangerous atmospheric commotions; and they were subsequently considered as evil omens in general, gaining, as it were, an ill name by their utility as monitors. So the Crow, garrulous before stormy weather, was afterwards regarded as a predictor of general misfortune. Many animals too were considered by the ancients as influenced by human prayers and supplications.† In this manner the observation of many real facts laid the foundation for superstitions, which terrified the ignorant, and which the designing made

* Some observations on the physical origin of such superstitions may be found in Cicero's work on Divinity.

† *Ego quae timebo,*

Providus auspex

Antequam stantes repetat paludes,

Imbrium divina avis inminentum,

Oscinem corvum præce suscitabo,

Solis ab ortu.—Horatius

use of in order to acquire respect, and to aggrandize their own power. Hence the rise of sorcerers, augurs,* and other impostors, the interpreters of omens and portenta, who pretended, in the peculiar flight and song of birds, to read the destinies of monarchs and of nations. It is probable that out of a number of such predictions, some might happen to be true, where the sagacity of the augur penetrated farther into probable events than the ignorance of the multitude; and this fortuitous coincidence enhanced the public credulity, strengthened the empire of superstition, and became a fatal impediment to the progress of science throughout succeeding ages.†

* Consuluitque stryges nostro de sanguine, et in me
Hippomanes foetae semina legit equae.

Propert. lib. iv. eleg. v. 15.

Aristophanes, laughing at the dependance upon the predictions of augurs, makes the birds ludicrously chant their importance in the following words:—

Εσμεν δ' υμεν, Αμμων Δελφοι Δωδωνη φοιξε Απολλων
Ελθοντες γαρ πρωτον ετ' ρυεις ετω προς απαντα τριπεθε.

† Among many remains of augury extant at the present day, may be enumerated the common practice among our farmers, of nailing up dead Kites, Crows, Owls, Weasels, and other rapacious animals, against the doors of barns and outhouses: a custom which originated, as Apuleius informs us,

It may be proper to examine a few causes in point for the sake of illustration. Among all the birds of evil report among the ancients, the Owl stands foremost, as being the most generally regarded as the harbinger of mischief and of death. Pliny, the natural historian, represents the large eared or horned Owl, *strix bubo*, as a funereal bird, a monster of the night, the abomination of human kind.* And Virgil describes its death howl from the top of the temple by night; a circumstance introduced here by the poet, as a precursor of the death of

* *Bubo funebris et maxime abominatus publicis praecipue auspiciis, deserta incolit, nec tantum desolata sed dira etiam et inaccessa, noctis monstrum, nec cantu aliquo vocalis, sed gemitu. Itaque in urbibus aut omnino in luce visus dirum ostentum est.*

Plin. Hist. Nat. lib. x. c. 12.

Quis quaeso ovum bubonis videre possit, cum tam avem ipsam vidisse prodigium sit. *Plin.*

in an endeavour to terrify the infaustae aves, and warn them not to obtrude themselves upon the family; the superstitious often imagining that, by avoiding the omen, they could avert the impending mischief. *Quid, istas nocturnas aves, cum penetraverint larem sollicitè praeheensas foribus videmus adfigi, nisi quod infaustis volatibus familiae minantur exitium, suis luant cruciatibus.*

Apul. Met. lib. iii.

Dido.* Ovid constantly speaks of the presence of this bird as an evil omen;† and the same notions respecting it may be found among the effusions of most of the ancient poets:‡ indeed,

* Solaque culminibus lethali carmine bubo
Saepe queri, et longas in fletum ducere voces.

Virg. Aeneid. iv. 462.

† Foedaque fit volucris, venturi nuncia luctus
Ignavus bubo, dirum mortalibus omen.

Ovid. Met. v. 550.

Eumenides stravere torum tectoque profanus
Incubuit bubo, thalamique in culmine sedet.

Ovid. Met. vi. 432.

Ter pedis offensi signo est revocata, ter omen
Funereus bubo lethali carmine fecit.

Ovid. Met. x. 452.

Tristia mille locis Stygius dedit omnia bubo.

Ovid. Met. xv. 791.

‡ Nocturnaeque gemunt stryges, et feralia bubo
Damna canit.—*Stat. Thebaid. iii. 511.*

Hic vultur, illic lucifer bubo gemit.

Senec. Herc. Far. 686.

Bubilat horrendum ferali carmine bubo

Humano generi tristia fata ferens.

Epig. de voc. av. et quad. Anthol. vet.

Lat. Ep. cxliii. 33.

Quod trepidus bubo quod strix nocturna queruntur,

Quod strident ululantque ferae.—*Lucan, lib. vi.*

there is scarcely a poet, ancient or modern, who does not speak of the Owl in this point of view.*

The bird called by the Greeks βυας, seems to be the same as the Roman *bubo*, and was also reckoned an ominous and ill fated bird.† Some authors, too, have considered the καλχis as the Owl: Homer identifies this bird with the χυρινδος,‡ also supposed by some commentators

* The superstitious opinion that the Owl is the barbing of death, still prevails among the ignorant of modern Europe. In England, no Village Ghost, or Fairy Dance, no pizgy maze, or haunted house, is more common than a death foretold by the Owl.

The remarkable appearance of the upright shadows in some foggy moonlight nights, as well as some curious atmospheric refractions, have probably cooperated with ocular spectra, in giving birth to the monstrous relations of nocturnal spectra and apparitions, which so mightily terrify the country peasants.

† Jam si historicos consulas apud Dionem in morte Augusti, cùm decrevit senatus, ut publice supplicaretur propter ejus valetudinem, τότε συνεδριον κεκλεισμενον ευρεθη, και βύας υπερ αυτε καθημενος εβυξε.—Et in morte Commodi Βυας απ' αυτε (καπιτωλις) εβυξε, &c.

Bochart. *Hierozoicon*, lib. ii. c. 22.

See also Arist. Hist. An. lib. viii. c. 3.

‡ Καλχιδα κικλησκησι θεοι ανδρες τε κυρινδον.—Homer.

to be the Owl.* The striking sapient mysterious and peculiar look of this bird, its occasional and uncertain appearance in towns, and its loud and dismal cry, uttered often when all other birds are quiet, as well as its being the bird of night, are the circumstances which, aided by an occasional coincidence of events, have caused the Owl to be regarded in the light of an evil omen. This, and similar superstitions, will appear less surprising, when it is considered that crafty and designing persons had an interest in their propagation.

The dread attached to Owls seems to have been extended to other birds of the night; a circumstance which rather corroborates the idea that they were dreaded, in a great measure, from being companions of darkness and obscurity. Spencer has given us a most woeful catalogue of harmful fowls, in the second book of the *Fairie Queene*.† The hollow booming

* There are a great variety of names for the Owl, as well as for other birds, which, by all writers, except natural historians, since the time of Linnaeus, appear to have been used, in a great measure, promiscuously.

† Even all the nation of unfortunate
And fatal birds about them flocked were,
Such as by nature men abhorre and hate,

of the Bittern from the pool on a still evening, and the hoarse sound of the Nycticorax and Fernowl, are equally striking, may be easily imagined plaintive, and seem capable, when uttered in the stillness of evening, of exciting ideas of melancholy, and of inducing in the minds of the vulgar and ignorant a notion of their being connected with misfortune.*

The Cornix of the Romans was another bird represented as ominous, who, by his croaking, prognosticated evil;† but, whether the Cornix

The ill faced Owle, death's dreadful messengere ;
 The hoarse Nightraven, trump of dolefull dreere ;
 The leather winged Bat, daye's enemy ;
 The ruefull Strich still waiting on the beree ;
 The Whistler shrill, that whoso hears doth die ;
 The Hellish Harpies, prophets of sad destiny.

Spen. Fairie Queene, lib. ii. 12, 36.

The Harpy has been supposed by some to be the Madagascar Bat.

* How sweetly did they float upon the wings
 Of silence, through the empty vaulted night,
 At every fall soothing the Raven down !

Milton's Comus.

† Saepe malum hoc nobis, si mens, non laeva fuisset,
 De coelo tactas memini praedicere quercus,
 Saepe sinistra cava praedixit ab illice cornix.

Virg. Ecl. i.

was the Raven, or the Crow, or, indeed, of what species, is uncertain. It was, however, some bird of this genus; and to identify the species is of more consequence to the natural historian than to the meteorologist. It does not appear that the *Cornix* was the same bird as the *Corvus*. The augurs appear to have represented the latter as a bird, which was ominous croaking on the right hand; and the former, on the left hand, the *Cornix*; as was observed by Cicero*

Quod nisi me quacumque novas incidere lites,
Ante sinistra cavâ monuisset ab illice cornix.

Virg. Ecl. ix.

See also Plin. Hist. Nat. lib. x. c. 12.

The word *sinistra* here seems to refer to a Grecian superstition about ill omens being given on the left hand, of which our poet was mindful when he said,

“That Raven on yon left hand oak,
Curse on his illbetiding croak!”

Gay, Fab. &c.

* Jupiterne cornicen a laevâ, corvum a dextrâ canere jussisset. ?—*Cicero de Divin. lib. i. c. 7.*

Cur a dextra corvus, a sinistra cornix faciat ratum.

Cicero de Divin. lib. i. c. 39.

Some make the Greek *κοραξ* to be the Roman *Corvus*, and the English Crow, and the Greek *κορῶν* to be the *Cornix* of the Romans, and the Raven of Great Britain. Linnaeus, however, has called the Raven *Corvus Corax*, and the Crow,

in his book of Divination, and afterwards by Bulengius, in his book on Augury.

The *Picus* was also another of the oscines, whose voice was feigned injurious to travellers.* This fable might have been founded on observing the garrulity of the bird before Rain; which might become an impediment to a journey. Linnaeus represents this bird to have been the Woodpecker, or Pickatree; but it is difficult to identify the names and species of birds spoken of by the ancients.† The *Parra* was another bird with whose ill portending song Horace cursed the impious.‡

It was long ago observed, as mentioned in another chapter, that the frequent immersion of certain fowls in the water portended Rain; and they were, consequently, considered unlucky alites; while others, who never dived,

Corvus Coronae. I refer the reader to Aelian, Aristotle, Pliny, Gesner, and Aldravandus.

* Teque nec laevus vetet ire picus

Nec vaga cornix.—*Horat.*

† *Picus* may be only masculine of *pica*, the Magpie, a bird which, in windy and stormy weather, I have observed to be garrulous, and to fly high in small flocks, uttering its cry.

‡ Impios parrae reciñentis omen

Ducat.—*Hor. Od.*

were regarded as good signs; a fact observed by Niphus in his book of Augury, who quotes a verse to that effect from Aemilius.* And Virgil makes Venus predict the safety of the Trojan fleet to Aeneas from the flight of Swans.†

Another familiar instance of the effect of association of ideas is the following:—Vultures, who prey on carcasses, naturally followed armies, and inhabited the field of battle after the conflict: the ancients, therefore, associated their appearance with destruction, and they became evil omens, particularly when following armies.‡

* Cygnus in auspiciis semper laetissimus ales,
Hunc optant nautae quia non se mergit in undis.

Niphus de Auguriis, lib. 1. c. 10.

† Namque tibi reduces socios classemque relatum,
Nuncio et in portum versis aquilonibus actam
Ni frustra augurium vani docuere parentes,
Adspice bis senos luctantis agmine cygnos,
Aetheria quos lapsa plaga Jovis ales aperto,
Turbabat coelo; nunc terras ordine longo,
Aut capere aut captas jam despectare videntur.
Ut reduces illi ludunt stridentibus alis,
Et coetu cinxere polum, cantusque dedere,
Haud aliter puppesque tuae, pubesque tuorum,
Aut portum tenet, aut pleno subit ostia velo.

Virg. Aeneid, i. 400.

‡ Potter has some observations on this in his *Antiq. Graec.* and refers to Plutarch, Aristotle, and Pliny.

There is a superstitious respect paid to the Swallow and the Martlett, in many parts of the country, at the present day. Their nests are protected, and it is considered unlucky to molest them by accident: this is a very old opinion, mentioned by many writers: and the circumstances of their building so close to the habitations of man indicates, I think, that they have long enjoyed freedom from molestation.* For animals seem to regulate their conduct according to circumstances: and it is not only that the individual learns to avoid danger, but the whole species seems by degrees apprized of the state of either enmity or amity between them and man, and to act in conformity with this knowledge. There are parts of oriental India, where the religion of the Brachmans protects animals from injury, in which Hawks

* ——— the Martlett

Builds in the weather on the outward wall,
Even in the force and road of casualty.

Shakspeare.

Odimus accipitrem quia semper vivit in armis,
Et pavidum solitos, in pecus ire lupos,
At caret insidiis horminum quia mitis hirundo,
Quasque colat turres chaonis ales habet.

Ovid. Art. Amat. ii. 150.

and other birds are so familiar and daring, as to snatch the food from out of dishes, as men are carrying them from the kitchen to the place of repast. The respect paid to the Swallow may have originated in its being the harbinger of spring, and from its inhabiting churches, temples, and other sacred places; and, perhaps in some measure, from its utility in clearing the air of insects.* Swallows, at one time, among the Greeks, appear to have been regarded as an evil omen when a flock of them settled on a tent, or ship. The low flight of Swallows predicts Rain, and their settling on buildings is an autumnal custom previous to their departure, or to the commencement of wintry weather; hence have they, perhaps, been considered as portending evil.

The crowing of Cocks was reckoned ominous, particularly as prophesying the event of wars. It is from the known courage of this bird in

* Ore bono volitans muscas deprendit hirundo,

Atque ita viventi pascitur illa cibo.

Quumque lacus circumvolitet vel florida prata,

Illius ambages quis numerare potest?

Cypselus at vacuo rapidis volat aethere pennis

Nec metuit milvos accipitremve ferum.

Epig. Incert. Auct.

combat, that he was sacred to Mars, and called *Αρεος νεοττος* by Aristophanes. The Galli Cantus presaged the victory of Themistocles over the Persians; and the feasts *Αλεκτρυώνων ἀγών* were called so from this event, and were celebrated by fighting Cocks. And a victory of the Boeotians over the Lacedaemonians was also said to be foretold by the Cocks. There are, besides the above, many other superstitions relating to Cocks, all, apparently coming from some observance of fact. At a later period, Cocks were said to crow all night about Christmas time, a fable adverted to by Shakspeare in *Hamlet*.* This fancy is easy of explanation; for the crowing of the Cock being the announcer of the dawn of light, he is said to crow all night at that season of the year, which, though really the darkest, namely, midwinter, was the season at which the light of Christianity was

- * Some say that ever 'gainst that hallowed season,
At which our Saviour's birth is celebrated,
The bird of dawning croweth all night long.
The nights are wholesome, then no mildew falls,
No planet strikes, nor spirits walk abroad;
No fairy takes, nor witch hath power to charm;
So gracious and so hallowed is the time.

Hamlet.

said first to gleam on the gloom of the Pagan world.*

There is this remarkable circumstance about the crowing of Cocks. At several different times in the course of the night, a general crowing may be heard, from all quarters where there are Cocks, the first that begins apparently setting all the rest off; and this fact is remarkably striking in places where numbers of Cocks are bred for the purpose of fighting. As far as I can observe, excepting at the dawn of day, these crowing matches happen at very irregular and uncertain periods. The ancients, however, seem to have regarded them as taking place at marked intervals of time which appear to have caused their division of the night watches by the first, second, and third, *Αλεκτροφωνιας*, as mentioned by St. John.†

They say that if a dead Kingfisher be hanged

* The Vanes were said to have been originally cut out in the form of a Cock, and placed on the tops of churches during the holy ages, as an emblem of clerical vigilance; hence the name of Weathercock, in German *Wetterhahn*.

Vide *Beckman's Erfindungen*, vol. i.

† Some observations on this subject may be found in vol. i. of Dr. Hales's *Analyses of Ancient Chronology*, 4to. London, 1810.

up by its bill, its breast will always be turned to the quarter from whence the Wind bloweth; this when the Wind is strong may be accounted for mechanically from its shape, but it is asserted to be the case always; and the bird called therefore the Natural Weathercock.*

It is an old observation, that the appearance of a certain Beetle, called *Tenebrio mortisagus*, was a presage of death, which may be founded on observation. For the appearance of the insect may, in reality, forebode the death of sick persons in the house where it is observed; since the same peculiarity of atmosphere which may bring out the Beetle, may be such a one as would produce the death of the patient.

If it be by some such association of ideas as what has been above described, that most of the superstitious devotion paid to particular birds and animals has originated, the worship of the Ibis, and of the *Scarabaeus* in Egypt, and of many other animals in Asia and Africa, might prove, if we were able to trace them, to have sprung from a similar source.†

* See *Pseudonia Epidemica*, by Dr. Brown, 2d edit. p. 104.

† Some animals appear to have become sacred from their absolute utility, as the tame *Ichneumon* in parts of Egypt.

The popular persuasion, that if it rain on St. Swithin's day, it will rain some part of each day for forty days, may be ranked among superstitious notions originating in atmospheric phaenomena; for though the placing the prognostic to the account of St. Swithin must palpably be the effect of ignorance and credulity, yet there may be some natural reasons why, if rainy weather occur about the 15th July, it will be of some continuance, which I have noticed for many years to be the case.*

The superstitions respecting the Moon are without number. From noticing that the Tides and many important atmospheric changes were regulated by her conjunction with, and opposition to the Sun, she became at different times an object of worship among the Egyptian Nations, and among christians at a later period, the same circumstances gave rise to endless superstitions. The ancient Irish used to utter a benediction on the New Moon; and in the Highlands of Scotland at the present day, the girls get astride across a gate, at first sight of the Crescent, and say

“ All hail to the Moon, all hail to thee,

* *Vide infra* the Prognostications of Weather, deduced from the appearance of the Sky on St. Paul's Day.

*I prithee good Moon, come tell to me
This Night who my husband shall be."*

Aubrey, in his *Miscellanies*, actually declares that he knew two maids who sang this, and then going to bed dreamed of the two men that they respectively married afterwards.

A popular song, in the Scottish dialect, of the date of King James, or earlier, represents the seeing what is called the New Moon in the Old Moon's horns as a very unlucky omen.

Not only the ancient Egyptians, Greeks, and Romans made sacrifices at the time of the nascent Moon, and had numerous superstitions respecting the Moon in general, but also the Druids, and all the early Northern Nations did similar things, and entertained similar opinions, which shows that they must have been founded on some general facts; and I believe one of them to be the remarkable influence of certain states of atmosphere occurring about the time of the New and Full Moon on the human nervous system, exciting thereby a disposition to irritation or to melancholy, which made people at those times ascribe misfortunes to lunar influence.*

* See my *Atmospheric and Periodical Diseases*, London, 1817. For numerous superstitions relating to the Moon, see Brund's *Popular Antiquities*, by Ellis, 2 vols. 4to.

It is a curious fact mentioned by Mungo Park, that the Mandingo Nations of Africa have similar superstitions, and say a short prayer to the New Moon.

The ancient superstition of *The Man in the Moon*, is supposed to have taken rise from the passage in the Book of Numbers, where a man is related to have been punished with death for gathering sticks on the Sabbath.

The various rustic operations to be began on certain days of the Moon are well known, and described by Hesiod, Virgil, and others, many of them are still retained in Europe, and even this very winter, in Jan. 1823, I have had inquiries made of me in Sussex when the Moon was at the full? in order that persons might cut their corns in the wane, that they might continue further to waste with that heavenly body.

In parts of Wiltshire, they say, it is unlucky to look at the New Moon, for the first time, through a glass; showery weather about that time of the Moon, which might keep the spectator in doors, and make him see her crescent first through a window, may be a bad prognostick for the month. The ignorant run out of doors and turn the money in their pockets, if they hear by chance of her first appearance.

In Sussex they say a Saturday's Moon is always a stormy one. Many people positively assert that Friday is always either the fairest, or the worst day in the week : what this originated in, unless it were some casual occurrence of a succession of fine and of wet Fridays, I know not.

Among the superstitions referable to Atmospheric Phaenomena, may be mentioned the story of the Flying Dutchman, a ship, said by mariners, to be seen about the Cape of Good Hope in blowing weather, under the following extraordinary circumstances. She is never known to get into port, and is seen at uncertain periods sailing at an immense rate before the wind, under full press of canvas, in the most violent gales. The story attached to this appearance is, that she was a merchant ship from Holland, and that the captain having sworn a tremendous oath, in consequence of not being able to make the port, he was condemned, as a punishment, together with all the rest of the crew, to beat about the sea till the Day of Judgment. From the corroborated accounts of many navigators, there seems to be no doubt but that something is seen, which they take for a distant sailing vessel ; but the most intelligent naval officers, with whom I have

conversed, seem to regard it as some waterspout, or else a cloud reflected in the mist, or some other atmospherical phantom, which the superstitious imaginations of the sailors have converted into a ship, and attached thereto the above fable, as well as many other remarkable histories. Those peculiar refractions, whereby the hulks of distant vessels appear elongated, are well known, as is the elevation of the coast seen from the sea, and the *Fata Morgana*.

Numerous other similar errors of reason might be added, were it necessary to confirm the unlucky devotee of fable and fancy, who is cursed for walking under a ladder, or toward whom the salt fell on a Friday, that he is perverting physical truths by his own disturbed imagination. The idle tales about Pandora and about Fortune, and many others, are referable to a physical origin. Idleness too, is a great propagator of superstition. The love of supernaturality, anxiousness, and mystic feelings of some persons, viewing the great uncertainty of future events, and the casualties of life, render them more disposed to trust to their stars than to their wits, and they content themselves with praying to the fickle Goddess not to crush their fabric, and, like Horace of old, sing

“ Injurioso ne pede proruas
Stantem columnam.”

While others of a different turn of mind, preferring prudence to prayer, and choosing rather to apply their shoulders to the wheel than to call on Hercules, chant the more sensible song of Juvenal :

“ Nullum numen habes si sit Prudentia, quamvis
Te facimus Fortuna deam coeloque locamus.”

The different successes in life of these two kinds of persons are well discussed in Miss Edgeworth's well known and excellent story of Murad and Sanadin.

SECTION I.

Of some Meteorological Antiquities and Superstitions, not inserted in the first edition of this work, particularly those anciently attached to particular Days and Festivals in the Kalendar, which have been called Superstitio Calendaria.

ANTIQUARIANS as well as Meteorologists may be amused with the following collection of superstitions, relating to particular days in the

year. The former may be interested in tracing their historical origin, and the latter in developing their particular physical causes.

The Festival of the Circumcision, January 1, was held by the Scotch in former times as ominous, and as affording a prognostick of the weather of the coming year, of which our poet Churchill makes this month the leader—

“ Froze January, leader of the year,

Minced pies in van, and calf’s head in the rear.”

Sir John Sinclair quotes the parson of Kirk-michael, in the County of Banff, as relating the following superstition of the people. On the first night of the new year, I suppose New Year’s Eve, they carefully watch the weather, and from the disposition of the Air and direction of the Wind, they pronounce the whole year to come. If the Wind then blow from the West, they call it *Da na Coille*, or the Foundation of Trees.* The English of the same period spent this Eve, according to national custom, with a wassail bowl and Christmas pastimes.

Twelfth Day, January 6.—In Gloucestershire, on the eve of the Epiphany, the farmers have a

* Stat. Acc. Scotl. xii. 458.

custom of lighting twelve small fires, and one large one in the middle of them, in a field: the origin of this custom is unknown.* Perhaps the twelve small fires are lighted in honour of the twelve days, and the large one in honour of Christmas.

St. Agnes' Day, January 21, is said to have some meteorological superstition attached to it, in consequence of the miraculous preservation of the Virginity of that Saint by means of Thunderstorms, during the tenth persecution of Dioclesian.

St. Vincent, January 22.—There is an ancient admonition, to note down whether the Sun shines on St. Vincent's Day.† *Vincenti festo si sol radiet memor esto.*

The Conversion of St. Paul, January 25, whatever the reason of it may be, has always been reckoned particularly ominous with respect to the future weather of the year; and, what is very curious, this superstition prevails in many countries distant from each other.

In an ancient and curious work, entitled Wit's Misery, &c. by T. Lodge, we find an

* See many curious observations in Naorgeorgus, and in the Paraphrase of him by Barnaby Googe.

† Refer to Scot's Disc. Witchcraft, xi. 15.

account of the popular belief in the prognosticks deducible from the weather of this day, and the following lines are given in proof of it:—

“ Clara dies Pauli bona tempora denotet Anni,
Si fuerint Venti, designant proelia Genti,
Si fuerint Nebulae, pereunt Animalia quaeque
Si Nix, si Pluvia, designent tempora cara.”

According to the old Almanacks, when this day was clear, the common people expected a fruitful year: but I have never discovered by examination of journals, that after clear weather at this time of year, Pomona, the following autumn, has evacuated her cornucopia more bounteously than in less auspicious seasons. Cold and clear weather at the end of January is, nevertheless, admittedly both salubrious and productive often of a good spring. We find the following lines recorded in Bourne’s Antiquities of the Common People:—

“ If St. Paul’s Day be faire and cleare,
It doth betide a happie yeare.”

Hospitian observes—*Est hic dies apud plebem criticus utpote cuius serenitas fructuum abundantiam, venti bella, nebulae pestem, nix et pluvia caritatem indicare creduntur.*

Latin verses, to the same effect as those cited

above, are given in Robert of Avesburg's History of Edward III. edited by Hearne, thus translated in the same work:—

“ If St. Paul's Day be fair and cleare,
It doth betide a happy yeare;
If it do chance to snow or raine,
Then shall be deere all kinds of graine:
But if the Wind then be alofte,
Warres shall vex ther realm full ofte;
And if the clouds make darke the Skie,
Both Neate and Fowle this yeare shall dye.”

Gay, in his Trivia, quotes the superstition relating to the atmosphere on St. Paul's Day, and concludes—

“ Let no such vulgar tales debase thy mind,
Nor Paul nor Swithin rule the Clouds and Wind.”*

Schenck in his Treatise on Images says, that in Germany they used to drag St. Paul and

* Mutual abuse seems the privilege of birds of a feather, and of one vulgar poet to abuse another. Nothing is so intolerable to superstition as a rival absurdity. Perhaps no poet ever made choice of more vulgar subjects than Gay. Among other elegantiae we find Mulciber personified in a country blacksmith forging, not Thunderbolts but Pattens for a milkmaid whose name happened to be Patty, whence those implements took their origin and name.

We find him also eulogizing clean windows, dreading the Rain from Waterspouts from the roofs, and fainting at the sound of Signs in the street creaking in the Wind. This

St. Urban in effigy through the streets down to the rivers, if their respective feasts happened to occur in foul weather.

Bourne observes that this Saint did certainly labour hard to instruct mankind, and he allows him many virtues, but questions whether he can claim the prerogative of being a standing Almanack to indicate the coming weather.*

The extent and antiquity of the notion respecting the prognosticks deducible from the weather of this Feast of St. Paul, would induce us to allow that, for some physical reasons as yet unknown, this particular time of year was found to be critical. We know at present almost nothing of the particular laws of that apparent remote relation subsisting between many natural phaenomena, which we commonly ascribe to coincidence, and the mass of fables and absurd stories, connected with many physical truths, certainly tend to render the subject still more obscure. In modern times,

* Bourne's Antiquities, c. 18.

writer of odes to Walkingsticks and satyres on Umbrellas, who condemns ancient tales as vulgar, merely because they were the legends of Monks, is styled by Brand in his Antiquities, an elegant modernizer of ancient verses.

however, the number of Journals of the Weather that are made, and which the curious can always compare with the Calendar, may confute many of these superstitious predictions, and illustrate the real cause of others.*

This festival occurs at a time of the year when the earliest signs of spring are nearly beginning, and I remember seeing a curious and very philosophical treatise in German, on the prognosticks deducible from the weather at this time, in which the writer represents Hope standing on the tiptoe of expectation to open the Portals of the Year, and examine the prognosticative tablets which decorated the vestibulum of Janus, the windows of whose temple were barred with icicles and the ground carpeted with Snow.†

* There is something very remarkable in the history of what are commonly called coincidences, or such a coupling of events, having no particular known affinity, as cannot be referred to accident, by the known doctrine of chances.

† The following lines relate to the sort of scenes and weather which prevail commonly on the vigil of St. Paul:—

“ Winter’s white shrowd doth cover all the ground,
And Caecias blows his bitter blaste of woe;
The ponds, and pooles, and streams in ice are bounde,
And famished birds are shivering in the snowe.

Candlemas Day, February 2. I have already quoted a similar prognostick of the coming weather, deduced from that which happens on this day.

An old metrical proverb, frequently quoted in *Poor Robin*, *Moore*, and other Almanacks reminds us:—

“If Candlemas Day be fair and bright,
Winter will have another Flight.”

This adage seems a free translation of the following ancient verses:—

“Si Sol splendescat Maria purificante,
Maior erit glacies post festum quam fuit ante.”

It seems to be actually true, that clear wea-

Still round about the house they flitting goe,
And at the windows seek for scraps of foode,
Which charity with hand profuse doth throwe,
Right weeting that in need of it they stooede,
For charity is shown by working creatures' goode.

The Sparrowe pert, the Chaffinche gay and cleane,
The Redbreast welcome to the cotter's house,
The livelie blue Tomtit, the Oxeye greene,
The dingle Dunnock, and swart Colemouse;
The Titmouse of the marsh, the nimble Wrenne,
The Bulfinch and the Goldspinck, with the king
Of birds the Goldcrest. The Thrush now and then
The Blackbird wont to whistle in the spring,
Like Christians seek the heavenlie foode St. Paul doth
bring.”

Anthol. Austr. et Bor.

ther about this time of year is followed by a continuation, or a return, of severe cold and frost. While the fixing the omen on this particular day, must, as on numerous similar instances, be referred to the enthusiasm, and constant recurrence to subjects of a religious nature, of our ancestors, displayed in nothing more clearly and uniformly, than their custom of converting every natural phaenomenon into a sacred memorial of some important event in sacred history, of which the common names of most of our old plants, known in early times, furnish a familiar example.* The custom of light-

* We are reminded of the first appearance of the Snowdrop *Galantha nivalis*, that universal harbinger of spring, and the earliest of the Primaverall Flora, and of other plants which follow, in the following lines:—

The Snowdrop, in purest white arraie,
First rears her head on CANDLEMAS DAIE,
While the Crocus hastens to the shrine
Of Primrose love on ST. VALENTINE.
Then comes the Daffodil beside,
Our Ladies' Smock at OURE LADYE TYDE,
Againste ST. GEORGE, when blue coats are worn,
The Harebells blue the fields adorn,
While on the day of the HOLY CROSS,
The Crowfoot gilds the flowerie grasse.
When ST. BARNABY bright smiles night and day,
Poor Ragged Robin blooms in the hay.

ing up the churches with candles, in honour of the Purification of the Blessed Virgin Mary, is well known; and I find, by consult-

The scarlet Lychnis the garden's pride,
Flames at ST. JOHN THE BAPTIST's tide.
Against ST. SWITHIN's hastie Showers,
The Lilly white reigns queen of the Flowers;
And Poppies a sanguine mantle spread,
For the blood of the Dragon ST. MARGARET shed.
Then, under the wanton Rose, agen,
That blushes for penitent MAGDALEN.
Till Lammas Day, called August's Wheel,
When the long Corn stinks of Camomile.
When MARY *left us here below*,
The Virgin's Bower begins to blow;
And yet anon the full Sunflower blew,
And became a Star for BARTHOLOMEW.
The Passion Flower long has blowed
To betoken us signs of the HOLY ROOD.
The Michaelmas Daisy, amonge dead weeds,
Blooms for ST. MICHAEL's valorous deeds,
And seems the last of flowers that stood
Till the Feast of ST. SIMON and ST. JUDE,
Save Mushrooms and the Fungus race,
That grow as ALLHALLOWTIDE takes place.
Soon the evergreen Laurel alone is seen,
When CATHERINE crowns all learned men.
Then Ivy and Holy Berries are seen,
And YULE CLOG and WASSAIL come round again.

Anthol. Austr. et Bor.

ing some curious ancient records, that an imaginary power over the elements was by superstitious people ascribed to these waxen tapirs, similar to that which some of the early Greeks and Romans attributed to torches.* Whether this superstition be susceptible of a physical

* Nargeorgus observes—

Mira est candelis illis et magna potestas
 Nam tempestates creduntur tollere diras
 Accensae, simul ac sedare tonnitrua coeli
 Daemonas atque malos arcere, horrendaque noctis,
 Spectra atque infaustae mala grandinis atque pruinae,
 Quam facile hi possunt omnes sedare tumultus.
 Et coeli et terrae pelagique, ut credere Christo
 Nil sit opus, veroque Deo committere cuncta.

A paraphrase on these lines by Barnaby Googe says—

“— Whose candelie burneth cleere and bright, a wonderous
 force and might
 Doth in these candells lie, which, if at any time they light,
 They sure believe that neither Storme nor Tempest dare
 abide,
 Nor Thunder in the Skie be heard, nor any Divel spide,
 Nor fearfull Sprites that walk by night, nor hurt by Frost and
 Haile,” &c.

In Wodde's Dialogues, under *Palm Sunday* and keeping of Candles, he says, these are useful *to light up in Thunder, and to bless even when they lie, a dying*. See a curious Form for the Benediction of Candles, recorded in Brand's Antiquities.

expletion or not I am incapable to determine, but I am unaware of any influence that a great blaze of light can exercise on impending Storms. However, a similar superstition to this, namely, that the music of bells will disperse Storms is founded on fact. In Weaver's Funeral Monuments, among a number of inscriptions on church bells, we find the following :

*“ Sabbata pango, funera plango, fulgura frango,
Excito lentos, dissipo ventos, paco cruentos.”*

And bells were formerly rung to dispel Storms as well as to repel the Devil. The aërial percussion being extended up to the clouds above, is known to produce changes in their structure. A discharge of artillery, in battle, has been known to bring down drops of water from an overhanging Raincloud; a circumstance which superstition has, before now, attributed to the tears of Heaven, shed for the destructive carnage going forward on Earth. That a great union of flames, by rarifying the air, which would naturally ascend, may, in some measure, do the same thing, is within the bounds of possibility.

The modern husbandman is used to laugh at the precision observed by the ancients in sowing, planting, reaping, and other rustic

operations on particular days : this practice, however, till within a very late period, was common in Europe, and even to this day is observed in many parts of Britain. Ray, in his *Proverbs*, observes, " Sow or Set Beans in Candlemas Waddle," that is, in the wane of the Moon, which is nearest to the Festival of the Purification. These old rustic rules correspond to the numerous observations on the *Opera et Dies* of Hesiod and other ancient writers. St. Blaze's Day is still celebrated in parts of England with bonfires; and Dr. Plott, in his *History of Oxfordshire*, has gone the absurd length of ascribing the name of this Saint to the Blaze of torches, lighted up on the 3d of February.*

The prejudice that birds begin to couple on the 14th of February, is another instance of the *Superstitio Calendaria*. By my journals of Natural History, and those of persons who have kept them for half a century before me, I find, however, that a large proportion of land birds begin to pair about this time of year. And this may have been the origin of those

* Brand *Pope Antiq.* cit. Plott's *Oxford*, p. 202. edit. of 1677.

numerous superstitions, and amatory customs, which have in most countries of Europe associated Venus and St. Valentine together.

Ghosts were said, in early christian times, to walk abroad much on this night; but I imagine this notion is a remnant of the observance of the Feralia, in ancient Rome, celebrated towards the close of this month, when the manes of departed friends were believed to hover over their respective graves.*

It is a popular belief that February is a very unwholesome month, and this is in a certain measure true. I have observed that epidemical fevers, and other atmospherical complaints, are wont to prevail much at this time of year. Anciently, it was said, that we were, during this month, under the scourge of the goddess Febris, an opinion well founded from the suddenness and destructiveness of Spring fevers.

We now come to consider the atmospherical

* It may be observed here, that many of the Religious Festivals of Christians were adapted to those of the Polytheistical Greeks and Romans. Our moveable Feasts correspond to their *Feriae Conceptivae*, and our fixed Festivals to their *Feriae Stativae*. Compare also the Tutelary Gods with the Patron Saints of Ancient and Modern Europe.

illusions of the next month, led by St. David, of which Churchill observes :—

“ March various, fierce and wild, with windcracked cheeks,
By milder Welchmen led, and crowned with Leaks.”

25th.—It is esteemed lucky to have fair weather at Ladytide. And the Daffodils are found to be always in blow, however early or late the season, time enough to adorn the Festival of the Annunciation. This is also believed of other plants, particularly the Marigold *Calendula officinalis*, and the little plant, called Our Ladies' Smock or Chemise de Notre Dâme *Cardamine pratensis*, which first blows about Old Lady Day.† It is said to be particularly lucky, among the many weathers of March, to have dust fly, particularly between the Showers.

There are some peculiar superstitions attached to the Moveable Feasts. Thus, the consecration

* Some derive the bearing of Leaks to the neighbouring custom of the *Cymtortha* practised by the Welch.

The Shamrock is worn on St. Patrick's Day by the Irish, in honour of the Saint's explanation of the Trinity by a leaf of Trefoil.

† See a curious Ode to Daffodillies in Herick's *Hesperides*. The *Narcissus Bulbocodium* used to be called Our Ladies' Petticoat.

of green leaves, particularly the blossoming Willows on Palm Sunday, is said to be a charm against witchcraft, ; and Scot, in his *Discovery*, compares this practice to the receiving consecrated salt, or the hallowing of candles.*

There was formerly a custom of going out early on Easter Morning to see the Sun dance, which it was alledged to do as an exulting memorial of the Resurrection. The precise origin of this custom is unknown. The word East signifies the place of rising, and is so called from its being that quarter where, owing to the Earth's rotary motion, the Sun and Stars appear to rise. Easter signifies the time of rising, or the Festival of the Rising of Jesus Christ. East Winds prevail much about the time of year at which this feast is celebrated, and when the Wind is in that quarter, the luminous bodies of the Heavens have often, as I before observed, an apparently wavy or dancing motion, occasioned by some peculiar motion in the atmosphere. I conceive, however, that the dancing of the Sun was a mere spectral illusion, to which mystical persons are peculiarly prone, while the viewing his rising was a common

* Scot, *Disc.* 157. cit. Brund, ii. 380.

emblem of the aforesaid miracle. Milton in a beautiful passage in *Lycidas*, makes use of this metaphor of the ascending Orb of Day for a similar purpose.* Perhaps the light of the Sun was on this occasion viewed in water, which by moving would cause it to dance, according to an allusion in the *Argonauticks* of Apollonius Rhodius, who compares this phaenomenon to the wavering love of Medea for Jason.†

On St. George's Day, April 23, the Fins believe, according to Tooke,‡ that whoever makes a riot is in danger from Storms and Tempests; merely, I suppose, because at this time of year April Showers prevail, which, being highly electrified so as to lighten, surprize us often with a loud and unexpected clap of Thunder, to which during winter we have been unaccustomed.

May Day customs are well known, such as dancing round Maypoles, making garlands of

* So sinks the Day Star in the Ocean's bed,
And yet anon uprears his drooping head,
And tricks his beams, and with new spangled ore
Flames in the forehead of the Morning Sky,
So Lycidas sunk low but raized high, &c.

† Ἡλίου ὡς τις δὲ δομοῖς εἰς πέλλεται αἰγλή
ῥδαρος, &c.—Arg. p. 756.

‡ Hist. Russia.

flowers, &c. all which are emblems of the power of reproduction called forth in spring. Milton has a beautiful Song still sung every May Morning at Oxford, in which he uses the word *dance* for the rising of the Sun; and this leads me to suspect, that the coming out at Easter to see the Sun dance, only meant to see him rise.*

* Now the bright Morning Star, day's harbinger,
Comes dancing from the East, and leads with her
The flowrie May, who, from her green lap throws
The yellow Cowslip and the pale Primrose, &c.

Dance is used like *saltus* and *chorus*, in various significations, thus in the

SONG TO SUMMER.

Hail! rural Goddess of Delight,
I woo thy smiles from morn till night;
Now no more rude Eurus blows
O'er mountains of congealed snows;
But thy faire handmaid, lovely Maie,
Treads the fresh lawns, and leads the waie.
Now, at Flora's earlie call,
The meadows greene and vallies all
Pour forth their variegated flowers,
To regale the sportive hours;
Hence then let me flie the crowde
Of busy men, and seke the woode,
With some Dryad of the grove,
By shades of Elm and Oak to rove,
Till some sequestered spot we find,
There, on Violet bank reclined,

The custom is still preserved in many parts of England, of going about with flowery garlands early on May Morning, and begging

We fly the Dog Star's burning heate,
Which cannot reach our green retreat.
While Zephyr, with light wispering breeze,
Softly dances in the trees ;
And, upon his muskie wing,
Doth a thousand odours bring
From the blomie mead below,
Where Cowslips sweet and Daisies blow ;
And from out her grassie bed
The Harebell hangs her nodding head ;
Hard bye, some purling stream beside,
Where limpid waters gently glide,
Iris shows her painted woof
Of variegated hues, windproof.
And with Water Lillies there,
The Nymphs and Naids braid the haire ;
And from out their leafie haunt,
The Birdes most melodious chant.
Then, sweet nymph, at eventide,
Let us roam the broke beside,
While the lovelorn Nightingale
Sadlie sings the woods ymel,
Till the Bittern's booming note
O'er the sounding marshes flote,
And the ominous Owls do crie,
While luckless Bats are flitting bye,
Then before the midnight houre,
When ghostlie Sprites and Pizgies coure,

a few halfpence. It is never omitted in Sussex, where the girls of the village assemble with their little garlands, and go from house to house, singing and asking for your remembrance of the garland.

If we examine the various customs of different countries in Europe, celebrated on this day, we shall find in them a close resemblance to those practised at the Floralia of the old Romans. The Christians have in fact transferred to the Festival of St. Phillip and St. James the rites that anciently belonged to Flora, of which, with their atmospherical origin, Ovid has given a very good description in his *Fasti*.*

If St. Urban's Day, May 25, be fair, the Germans count on a good vintage; but if stormy, the reverse is said to be indicated. The

We will betake us to our cot,
And be it there, O Sleep, our lot,
To rest in balmie slumberings,
Till the next Cock his matin rings.

Anthol. Austral. and Borecal.

* See Flora's account of herself, related by Ovid, *Fasti*, lib. v. 195, &c.

Alluding to Flowers, she says, v. 227:—

“ Quid Crocon aut Attyn referum Cinyrâque creatum
De quorum per me vulnere surgit honor,” &c.

Image of this Saint used to be placed in the market places, and crowned with flowers *ad levandum omen*.*

On the Festival of St. Barnabas, June 11, several superstitious rites used to take place.—Garlands of Roses and Woodroof used to be worn; girls used to be paid for gathering them, and they were paid for out of the parish accounts, like the Ribands on Trinity Sunday, and the Fern, called Red yr Mair, which the Welch strew before their doors on the Eve of Trinity Thursday.

This day was also called Sunstede, because Old St. Barnabas occurred, according to the ancient style, about the summer Solstice. Hence the proverb—

“Barnaby Bright, Barnaby Bright,
The longest day and the shortest night.”

On the Day of Corpus Christi, June 14, similar customs prevailed, and very pompous processions used to march, of people personating Jesus Christ and the Saints, with their appropriate emblems: thus, a Lady represented St. Catherine with her wheel; a Lamb was carried before St. John; figures of winged Angels were

* Aubanus, p. 282 —See also Regnum Papisticum, by Naorgeorgus.

dressed up, and the music of Sacred Bells was heard, while flowers were strewed on the ground.*

On the Vigil of St. John the Baptist, June 24, the old custom is still kept up in many parts of England, of lighting bonfires. Numerous Pagan rites adopted afterwards by the Christians are still observed on Midsummer Day. According to Durand, there is a curious custom of rolling a large wheel, bound with straw set on fire, down a hill on this day, which evidently signifies that the Sun, the Orb of Day, begins to roll down again from his greatest height. Naorgeorgus mentions the same, and adds, that the folks used to imagine that they could roll down and get rid of their ill luck with this wheel. As a counterpart to this, it may be observed, that Yuletide or Christmas is really Wheeltide, and signifies the return of the revolving Sun to his ascending course, as is observed by Gebelin† and Bede.‡

They used to leap exultingly over the Midsummer Fires, which were anciently *Feux de*

* See Barnaby Googe above cited.

† Gebelin, *Allegories Orientales*.

‡ See Ellis' edit. of Brund. Antiq. vol. i. p. 233.

joie, in celebration of the beginning year, formerly counted from the summer instead of the winter solstice.* In Sir Isaac Newton's Observations on the Prophecies of Daniel, are some curious observations on the adoption of Heathen customs by the Christians, which Gregory the Bishop encouraged, in order to convert infidels to christianity.† Borlase in his Antiquities of Cornwall, mentions the custom of festive Bonfires, and similar customs. Some of the ancient stone crosses found still standing in that county, are supposed to be Druidical Monuments older than the Christian aera; and that, like the cruciform figure of ancient cities, and other monumental references to the four cardinal points of the compass, they were originally astronomical emblems. At cross roads garlands were often hung up on St. John the Baptist's Day. ▲

The forty days' Rain, now ascribed to St. Swithin, used also to belong to this Saint. A very old memorial informs us, *Pluvias S. Joannis 40 dies' pluvii sequuntur,—certa nucum*

* Hence *Junius* is the young month, May or *Major* the eldest.

† See Gent. Mag. for May, 1733, vol. iii. p. 225, and Hone on the Mysteries, London, 1823.

pernicies.* The same prognostick is made if it rain on the Festival of the Visitation of the Blessed Virgin, July 2; and by others if wet on the Eve of St. Peter and St. Paul, a circumstance which confirms my explanation of this superstition, which I regard as founded on the experience of those who had observed, that whatever weather set in soon after the summer solstice was of long continuance, and which I have confirmed myself by reference to journals. I have hinted in the last section at the forty days' Rain still ascribed to St. Swithin, July 15, and I have repeatedly observed the gardeners look with anxious solicitude for a few drops on this day, who like the Romans, desired

Humida solstitia atque hyemes instare serenas.

Gay in his cockney and vulgar poem, the *Trivia*, observes :—

“ How, if on Swithin's Feast the welkin lours,
And every penthouse streams with hasty Showers,
Twice twenty days shall Clouds their Fleeces drain,
And wash the pavements with incessant Rain.”

Churchill observes :—

“ July, to whom the Dog Star in her train,
St. James gives Oysters and St. Swithin Rain.”

* Calend. Astr. Priscum.

It is commonly said of Rain on this Day, that it is St. Swithin christening the Apples.

In the Almanack of Poor Robin for 1697, may be found some instructive lines on this day.*

St. Margaret's Day, July 20, used to have some curious superstitions connected with it, relative to the fecundating power of this Lady's Festival, quite at variance with her character as

* Poor Robin ends a poetical account of the long rainy time likely to follow Rain on St. Swithin's Day, as follows:—

“ Better it is to rise by time,
And to make hay when the Sun do shine,
Than to believe in tales and lies,
Which idle Monks and Friars devise.”

The Scotch say:—

“ St. Swithin's Day, gif ye do rain,
For forty daies it will remain;
St. Swithin's Day, an ye be fair,
For forty daies 'twill Rain na mair.”

The Dog Star alluded to by Churchill signifies the period of the days when Sirius reigns. Horace alludes to the extreme heat of the *Hour of the little Dog*, in his Ode to the Fountain of Bandusia.

“ O Fons Blandusiae, splendidior vitro,
Dulci digne mero, non sine floribus,
Cras donaberis hoedo:
Cui frons turgida cornibus

a virgin martyr, for particulars of which I refer to Granger's Biographical History of England.*

Many customs observed on Saints' Days have

Primis, et Venerem et proelia destinat
Frustra : nam gelidos inficiet tibi
 Rubro sanguine rivos
 Lascivi soboles gregis.
Te flagrantis atrox hora Caniculæ
Nescit tangere : tu frigus amabile
 Fessis vomere tauris
 Praebes, et pecori vago."

* Granger's Bib. Hist. Eng. iii. 54.

I extract from the Star Newspaper the following Sonnet to this Saint, written on viewing Raphael's Picture of her :—

" Hail Saint ! whose form the pencil yet pourtrays,
Calling our minds to hallowed times of old,
When pastors grave, to guard their wandering fold
From prowling wolf that on meek virtue preys,
Gathered their flocks on holie ground to graze,
By fountains pure where sacred waters rolled.
And when at eve the vespers' bell had tolled,
Around their hopes the pen of faith did raise,
Inspire me to exhort our faltering race ;
To strive with him the martyr'd Virgin trod.
Then chere thou with thy form and tranquil face,
My sheep awaiting His directing nod,
Who whylome held on earth the heavenly mace,
And call'd us back to our appeased God."

Star, June, 12, 1820.

reference to the phaenomena of the time of year on which they are celebrated, and have been borrowed from the Festivals of the Heathen Deities.

On St. Bridget's Day, the custom of offering cakes was transferred from a rite performed to an ancient Pagan Deity, named Bridgit, which had its origin in the Feast of Ceres, who was, according to some authors, the identical Queen of Heaven, to whom the ancient Jewesses burnt incense, and made cakes.

St. James's Day, July 25, occurring at the time of year at which the young orchard fruit is set, and begins to swell, a custom has arisen on this day of blessing the Apples, of which we are reminded by a sacred manual, printed in 1555.*

* *Benedictio Pomorum in Die Sancti Jacobi.*"

"Te deprecamur omnipotens Deus ut benedicas, hunc fructum novorum pomorum, qui esa arboris letalis et pomo in primo parente jussa funeris sententia muletati sumus," &c. &c.—"*Dein Sacerdos aspergat ea aqua benedicta.*"

Manuale in usum Sarum, 64, 65.

It may be observed in general, that the benediction pronounced on Fruits, &c. was often instituted in acknowledgement and memorial of the universal care which the Creator takes of his creatures. At Rome, even at the present day, the farmers and others compel their flocks and animals

The Feast of St. Peter ad Vincula; or, Lammas Day, August 1, is said to have been the first of the Egyptian year, and to have been called Gule, a word soon converted by the Romans into Gula, and hence called the Gule of August. Old legends relate certain cures of disorders in the throat made this day, by touching the chains of the Saint.

On the Assumption of the Virgin Mary, August 15, it was formerly the custom to implore a blessing upon Herbs and Plants of diverse kinds, which, being afterwards burned, were esteemed a charm against witches.

The day following, dedicated to St. Roch, was celebrated as a general Harvest Home.

The quantity of knives given away at Croyland Abbey, on St. Bartholomew's Day, August 24, as noticed by M. Richard Gough, originated probably in the story of the knife with which the Saint was fled.*

The Feast of the Exaltations of the Holy

together to some appointed place, to receive a blessing from the Priests. A custom which some have deduced from the Practice of St. Anthony of Padua.

* "Three of these Knives found since, were marked with figures of the Whips so much used by St. Guthlac, in one court born by this house."—*Pop. Antiq.* 279.

Cross, September 14, can have no other connexion with the invention of Nuts in the hedges, than that it is celebrated at a time of year when they abound ; yet an ancient custom prevailed of going a nutting on Holy Rood Day, which it was esteemed quite unlucky to omit.* The particular times of year when nuts may be ripe has probably suggested this notion ; as also the flinging of apples and cabbages at one another, a custom practised at Kidderminster,—a ceremony to announce which, the bell in the turret of the townhouse used to ring.

St. Michael and All Angels, September 29. Many superstitious customs remain in force on this day, which it would be foreign to my object to dwell on, such as eating green Geese, on which Churchill remarks :—

“ September when by custom’s right divine,
Geese are ordained to bleed at Michael’s shrine.”

The procession in the Isle of Skye, and the breaking of the cake called Bannock, is another of those customs arising from the time of year which is described in Martin’s Description of the Western Islands,

* Grim, the Collier of Croydon, reminds us :—

“ This day, they say, is called Holy Rood Day,
And all the girls are now a nutting gone.”

But some of the superstitious on this day have a meteorological reference, as the ancient idea of Thunder happening on the 29th September, by way of firing a sort of *feu de joie*, by a discharge of celestial artillery, in honour of the vanquisher of Lucifer and his host, of which we are reminded by the note on this day in the observations on the ancient Romish Calendar, *Arx tonat in gratiam tutelarum numinis*.

The ancient genii natales, the patron deities of the pagan cities, and the patron saints of Christians, must be regarded as having a common origin in a certain propensity connate in human nature, to rely on supernatural assistance and support for an additional encouragement to action: similar feelings pervade all religions and all countries; and I have sometimes been inclined to the opinion of those who think that the eating Michaelmas Geese, which by the bye used to receive a previous benediction, originated in a regard to the whole flock of Guardian Angels celebrated on this day, and that these birds were selected from others of the feathered race, on account of the alarm which they gave of the danger to the Roman

Capitol, of which Ovid reminds us, in speaking of the original white colour of Crows before their curse :—

“ Nec servaturis vigili capitolia vore,
Cederet anseribus, nec amanti flumina cycno.”

Thus Rome was saved by Geese, and her faithful children by St. Michael and his Angels, hence perhaps the origin of the emblem.*

The Feast of St. Simon and St. Jude, October 28, was considered rainy as well as that of St. Swithin, and this, probably, because the autumnal rains began on or about that day. I have seen this passage somewhere, quoted from the very old Play of the Roaring Girls, “ I know it as well as I know, t’will Raine on Simon and Jude’s Day.” Holinshed informs us, that so great a quantity of Rain fell on this day, in 1536, as to prevent the action of a great battle that was to have been fought between the King’s troops and the Rebel army.†

* St. Michael vanquishing the Devil is a humourous subject for the figures of Vanes on the spires of churches, of which a gigantic specimen surmounts the steeple of the *Maison de Ville* at Bruxelles: there is a description and print of it in the *Delices des Pays Bas*, vol. i.

† In the *Sententiae Rythmicæ* of Buchler, p. 300, are the following lines :—

The Vigil of All Saints Day, November 1, also called Allhallow Even October 31, is still celebrated by the nocturnal revelry of rustic wassailers, who have a feast of apples and nuts, and by whom, in the North of England, it is called Nutcrack Night. The Feast of Old Fools is stated, in the Romish Calendar, to be observed to this day, afterwards transferred to the 1st of April. There used to be on this day a superstitious sacrifice of burning nuts, and deriving thence lucky or unlucky omens from the appearance of their cracking shells.*

All Souls Day, November 2, had also many similar customs, as the baking of great cakes, the lighting up of Hallow Eve Bonfires, and others. The poor used to have Soul Mass cake given to them, and in return to answer with wishing well to certain crops, saying:—

“ God save your soul,
Oats and all.”

“ Festa dies Judae prohibet te incedere nudè,
Sed vult ut corpus vestibus omne tegas.
Festa dies Judae cum transiit atque Simonis,
In foribus nobis esse putatur hyems.
Simonis, Judae post festum vae tibi nudè,
Tunc inflant genti mala gaudia veste carenti ”

* Horace alludes to some annual ceremony with nuts.

For Oats used to be sown about this time of year in many countries.*

I have before had occasion to notice the power of sound to disperse clouds: it might be probably owing to this circumstance that bells used to be rung all night long about Allhallowtide, a custom long since gone out of use.

The Feast of St. Martin, November 11, is, on the Continent, celebrated by a feast of Goose, just as that of St. Michael is in Britain. The killing of beasts at Martinmass is also a popular custom; and the smoked beef hung up on this day, and preserved all the year, has been often alluded to by poets.†

St. Catherine, the patroness of spinsters, and also of learned men, has left us some curious superstitious customs, still practised on her feast, November 25th, for an account of which

* The Author of Honoria says, in allusion to the Bells ringing for the All Souls Holy Mass, at St. Ambrose Church, at Milan :—

“ Ye hallowed Bells, whose voices through the aire,
The awful summons of affliction beare.”

† “ Ligna vehit mactatque boves et laetus ad ignem,
Ebria Martini festa November agit;
Ad pastum in sylvam porcos compellit, et ipse
Pingnibus interea vescitur anseribus.”

Collect. in mensium Opera.

I must refer to Barnaby Googe, and other early writers.

On St. Nicholas' Day, December 6, similar customs were practised: that of filling the silk stockings or shoes of Vestal Virgins with sweatmeats on the Vigil of this Saint, as if he himself had done it, for the girl to find in the morning, as practised in many Nunneries, is well known.

This Saint is the supposed patron of mariners, who used to invoke him in a Storm. In Minorea there is a chapel dedicated to him, wherein seafaring persons, escaped from shipwreck, still hang up votive pictures, and written tablets of thanks for their delivery; a rite which corresponds with one prevalent among the ancient Romans, well known by Horace's allusion to it in his beautiful Ode to Pyrrha.*

St. Thomas' Day also had its peculiar customs, many of which have a reference to natural phaenomena.

We have come to the consideration of Christ-

* " — Me tabula sacer
Votiva paries indicat uvida,
Suspendisse potenti
Vestimenta maris deo."

Hor. lib. i. Od. 5. 16.

mas, the celebration of which festival, by feasting and joy, the Wassail Bowl, the Yule Clog, and the merry Carrol, have many meteorological allusions; and though now used at the Anniversary of the Nativity, were derived from the Pagan rites of the Bacchanalia, to which origin the Ivy, Holly, Mistletoe, and other evergreen decorations of Churches and Houses afford an easy clue.

Cocks were said, at this season, to crow all night long, instead of keeping their wanted nightwatches. This notion had its origin in the popular belief, that the sound of the cock-crowing had the power of driving away ghosts, daemons, and other hideous creatures of the imagination, usually believed to walk about by night. Then these birds, by their perpetual vigilance on Christmas Eve, freed the country of evil spirits against the Feast of the Nativity. Prudentius, in a poem written early in the fourth century, observes:—

“ Ferunt vagantes daemona,
Laetos tenebris noctium,
Gallo canente exterritos,
Sparsim timere et credere.

Invisa nam vicinitas
Lucis salutis numinis,
Rupto tenebrarum situ,
Noctis fugat satellites.

Hoc esse signum praescii,
 Norunt repromissae spei,
 Quâ nos, soporis liberi,
 Speramus adventum Dei."

That Devils and evil Genii were anciently believed to wander about at night, and to be dispersed and sent away by the approach of morning, we are assured by a mass of collateral testimony. Cassian observes, "*Auroraque ita superveniente, cum omnis haec daemonum multitudo ab oculis evanescit.*"

Philostratus the sophist relating the apparition of the shade of Achilles to Apollonius Thyaneus, says, that it vanished with a little glimmering so soon as the Cock had crowed.

An early poet observes of a Spirit, that

"—— The morning Cock crew loud,
 And at the sound it shrunke in haste awaie,
 And vanished from our sighte."

Shakspeare observes in Macbeth, in allusion to the Nightwatches marked by the cock-crowing:—

"We were carousing till the second Cock."

And again in King Lear:—

"He begins with the Curfew, and walks till the first Cock."

In Romeo and Juliet is another passage of the same kind:—

“ ——— The second Cock has crow’d,
The Curfew Bell has toll’d,—’tis three o’clock,” &c.

Tussen, in his Hundred Points of Good Husbandrie, attempts an explanation of the power and periods of cockcrowing.

The Old Wives’ Prayer, in Herick’s Hess perides ends:—

“ In the dead of dampish night,
Drive all hurtful fiends us fro,
By the time the Cocks first crow.”

Du Cange observes, “ *In summitate crucis quae campanario vulgo imponitur galli gallinacei effigi solet figura quae ecclesiae rectores vigilantiae admoneat.*”

The pretended crowing all night of Cocks at this season is described in the last section.*

* In general, Cocks were believed to observe the night watches, or periodical Alectrophones. Milton in Comus observes:—

“ ——— The village Cock
Chants the nightwatches to his feathery dames.”

And again:—

“ Bright Chanticleere doth sound his clarion shrill.”

It appears that three of these Cockcrowings or watches were recognized as periodical, the last of which took place at break of morn:—

The Festival of St. Stephen, which immediately follows Christmas, is mentioned as a good day for sweating and bleeding of Horses, but I am unable to guess why.

St. John the Evangelist's Day, December 27, was esteemed a critical day in former times in judging of Brumal Epidemicks, and to prevent Rheums, and other diseases belonging to mid-winter, our forefathers instituted the salutary exercise of football.

Childermas, or the Feast of Holy Innocents, was esteemed a day of very unlucky omens.*

“ When the Cock, with lively din,
Scatters the rear of darkness thin;
And to the stack or the barndoor,
Stoutly struts his dames before.”

* See *Hospinian de Festis*, and other early writers on Christian Antiquities.

In describing, as above, the numerous superstitious notions and practices, attached by our forefathers to particular days in the Roman Calendar, it is by no means intended to ascribe the celebration of those days to superstitious origin. The annual memento to particular occurrences in Sacred History, which each revolving year presented on particular days appointed for the celebration of Saints, and Martyrs, and certain holy acts of the Church, operated so powerfully on the minds of devoted Catholics in those early ages, as to induce them, by a species of mental fallacy not uncommon, to mix up many other opinions, derived from imperfect atmospherical and

SECTION II.

*Of some additional Atmospheric Superstitions
and their causes.*

ANOTHER source of meteorological superstition may be sought for in the form of identifier physical knowledge, with the institutions necessarily connected with their particular festivals by the church: the authenticity of whose religious institutions and ceremonies cannot be considered as affected in any other way by these harmless acts of supererogation, than by the tendency the latter have to prove how firm a hold the former had on the human mind during the middle ages.

The same argument may be applied to the setting up of various images by catholics, which some protestants have endeavoured to represent them as paying a superstitious worship to; whereas, in reality, nothing can be more false than this libel. The truth is, the facts of Sacred History themselves were so very impressive, that a thousand emblems and figured representations of them were set up by various persons as memorials, the natural disposition of the human mind being to form to itself such mementos. And the early Christians did no more than substitute various emblematical figures, which represented real persons or real historical facts, for the emblems of the powers of the elements and of imaginary deities worshipped by the Pagans. The arguments of Dupius, Volney, and Middleton, who endeavour to confound superstitious and catholic rites, have already been too often answered to need further confutation.

tification, afforded by metaphysical language, for the freer communication of ideas. Thus the early philosophers having personified the combined powers of the atmosphere into Jupiter, he was, by subsequent generations, really believed in, and considered as an existing deity. So Horace descanting on the power of a clear cold night to freeze the fallen snow, observes:—

“ ——— positas ut glaciet nives
Puro numine Juppiter.”

This passage affords an example of the most genuine and physical sense in which the being of Jove is brought into notice. A similar view may be taken of the origin of other deities. Venus, or the procreative power;* Mars, or the belligerent; Vesta, or the spirit of fire †

* In the Dedication of Lucretius' Philosophical Poem *De Rerum Natura*:—

“ Aeneidum genetrix hominum, divumque voluptas
Alma Venus,” &c.—Lib. i.

The Persian worship is entirely that of the Elements.—
“ In the 30th year of Sapor II. the Magians accused the Christians to the King with loud complaints, saying,—‘ No longer are we able to worship the Sun, nor the Air, nor the Water, nor the Earth, for the Christians despise and insult them.’ ”—*Butler's Lives*, xi. 465.

† Nec tu aliud Vestam quam vivam intellige flammam.

Cupid, or the power of love; Pysche, or the breath of life; Fortune, or the principle of chance influencing the lot of mortals; and Prudentia, or the gift of foresight.

The celebrated anatomist, John Hunter, from the want of a literary education commensurate to his scientific attainments, was led into an injudicious use of this figurative language, in expressing his opinions on the physiology of vital actions, which has beguiled some of his followers into a most extraordinary sophistry of doctrine respecting the nature of life.

Finally, I may take an example, which may serve for all the other gods and imaginary beings, from the Νεφεληγεγρετα Ζευς or Jupiter riding on clouds: it affords a good clue to the origin of his divinity, more simply and philosophically described, by the great poet of nature :—

“ Principio coelum ac terras camposque liquentes,
Lucentemque globum Lunae, Titaniaque astra,
Spiritus intus alit, totumque infusa per artus,
Mens agitat molem, et magno se corpore miscet.”

The Greeks made out Castor and Pollux to be the offspring of Jove, and I am inclined to regard this also as an atmospherical fable. Jove,

or the elementary power, being figuratively said to produce those two luminous bodies, which were in reality the product of electricity; for I take them to signify the Fires of St. Helmo, as they were afterwards called. The alighting on a ship of either one or of two of them, being considered as affording a favourable or an unlucky prognostick. These curious electrical globes of light are frequently seen about the masts and rigging of vessels at sea, before storms, of which sailors reckon them very certain prognosticks. Hence the many nautical fables relating to these aforesaid Tyn-daridae of the Romans, of which Horace was mindful in his Ode to the Bark, which bore away his friend Virgil to Athens:

“ Sic te diva potens Cypri,
Sic fratres Helenae, lucida sidera,
Ventorumque regat pater,
Obstrictis aliis, praeter Iapyga:
Navis, quae tibi creditum
Debes Virgilium, finibus Atticis
Reddas incolumem, precor,
Et serves animae dimidium meae.
Illi robur et aes triplex
Circa pectus erat, qui fragilem truci
Commisit pelago ratem
Primus, nec timuit praecipitem Africum

Decertantem Aquilonibus,
 Nec tristes Hyadas, nec rabiem Noti:
 Quo non arbiter Adriae
 Major, tollere seu ponere vult freta.”*

I am curious to know whence were derived the notions of the ancients respecting the influence of certain constellations, by their rising or setting, on the weather; we read of the stormy Orion, the blustering Hyades? If these allusions were made only to the heliacal and cosmical risings of the stars, their immediate reference to the time of year, and its respective weathers, would explain their meaning; but many passages seem to relate to the respective rising, that is the exhorizontal emersion of particular groups of stars, which cannot possibly be supposed to have any influence on the weather.† From the examina-

* *Hor Carm.* lib. i. 3.—The reader will find some curious historical falsehoods exposed, which have arisen out of personification, in *Dupuis’ Origin de tous les Cultes*, 3 vols. 4to. with plates.—

Aratus observes:—

† * Ἀκρα γεμῆν νυκτῶν κεῖναι δυοκαίδεκα μοῖραι
 Ἄρκιαι ἐξαιπεῖν τὰ δὲ που μέγαν εἰς ἐνιαυτὸν,
 Ὡρη μὲν τ’ ἀρόσαι νειοῦς, ὥρη δὲ φυτεῦσαι,
 Ἐκ Διὸς ἤδη πάντα πεφασμένα πάντοθι κεῖται.
 Καὶ μὲν τις καὶ νηὶ πολυκλύστου χειμῶνος
 Ἐφράσαι, ἢ δεινοῦ μεμνημένος Ἀρκτούροιο,

tion of the gods, we descend to that of their weapons, and so from Jove to his thunderbolts; for of this terrific instrument I have no doubt but that we shall find a philosophical, and an easy explanation in the Meteorolites of modern meteorologists. These supposed Lunar Stones, as they have been fancifully called, from their

Ἡ δὲ τέων ἄλλων οἳ τ' ὤκεανοῦ ἀρύονται
 Ἀστέρες ἀμφιλύκης, οἳ τε πρώτης ἔτι νυκτός.
 Ἦτοι γὰρ τοὺς πάντας ἀμείβεται εἰς ἐνιαυτὸν
 Ἡέλιος, μέγαν ὄγμον ἐλαύνων· ἄλλοτε δ' ἄλλω
 Ἐμπελάει, τοτὲ μὲν τ' ἀνιῶν, τοτὲ δ' αὐτίκα δύνων·
 Ἄλλος δ' ἄλλοιήν ἀστὴρ ἐπιδέρκεται ἡῶ.
 Γινώσκεις τάδε καὶ σύ· τὰ γὰρ συναιδέται ἤδη
 Ἐννεακαίδεκα κύκλα φαεινοῦ ἡελίοιο,
 Ὅσσα τ' ἀπὸ ζώνης εἰς ἔσχατον Ὠρίωνα
 Νύξ ἐπιδινεῖται, Κύνά τε θρασὺν Ὠρίωνος·
 Οἳ τε Ποσειδάωνος ὀρώμενοι ἢ Διὸς αὐτοῦ
 Ἀστέρες ἀνθρώποισι τετυγμένα σημαίνουσι.
 Τῶ κείνων πεπόνησο. μένοι δέ τοι, εἴποτε νηὶ
 Πιστεύεις οὐρεῖν, ὅσα που κεχρημένα κεῖται
 Σήματα χειμερίοις ἀνέμοις ἢ λαίλαπι πόντου.

Arat. Dios. 10.

Virgil observes:—

“Nec frustra signorum obitus speculamur et ortus,
 Temporibusque parem diuersis quatuor annum.”

Virg. Geor. i. 258.

Ovid speaks of the

“—Olenia signum pluviale Capellae.”—*Fasti*, v. 113.

And many other similar passages might be quoted.

imagined projection from the Moon, were described very accurately by Livy, whose commentators absurdly ridiculed him for the description of a phaenomenon which modern experience has proved to exist in reality.*

There are many superstitions attached to Meteors of different kinds, which may be naturally accounted for from the tendency of the mind to connect fear with mystery of any kind, and to ascribe to hidden causes of a fanciful nature, effects which, from their suddenness, brilliancy, and the gloomy period of night in which they appear, are calculated strongly to excite the feelings. Hence the fables about the Dead Men's Candles, Corpse Candles, and Fetch Lights, which we so often hear of in

* However astonishing it may seem, yet I believe it is nevertheless true, that the ancient Ephesians worshipped the Meteorolites in their Diopetus. This imaginary being, whose idolatrous worship is alluded to in the *Acta Apostolorum*, xix. 35. in fact, turns out on examination to have been nothing more than a Lunar Stone of immense bigness. A similar gigantic stone fell from the air some years ago in India, and was actually worshipped by the inhabitants, who considered it as a creature of Heaven. I rather think this event happened in August, 1812. But of the date I am uncertain. I have observed the fact quoted in M. Howard's *Journal of the Meteorology of London*.

the country ; hence the fiery apparition, known in Wales by the name of Tanwee, which it is said “ shoots and mours not unlike a Glavie ;” hence the stories of Friar’s Lantern, and others, all which appearances are forms of the Ignis Fatuus.* In like manner, the more lofty Meteors have been fancied flying Dragons, Griffins, and other hideous and imaginary forms of terror, which Shakspeare has called

“ Meteors which fright the fixed Stars of Heaven.”

Numerous were the omens attached by credulous persons, in former days, to the manner in which candles burnt, and particularly to the colour of their flames. When they burned blue, it was accounted ill luck, or else that some ghostly apparition were announced. Now when the brain and nervous system are in a certain state peculiarly favourable to spectral illusions, the imagination may easily colour the flame of a candle without its really changing its tint, just as

* The sudden and unexpected appearance of any remarkable phaenomenon seen in the still hours of night, and particularly when we are alone, occasions a peculiarity of feeling quite different from fear, and which phrenology refers to the activity of the organ of supernaturality. I remember well experiencing this sentiment, when, in 1809, I suddenly made the first discovery of the Comet of that year.

in fevers, people see spots of colours on the wall, or imagine insects on the bed clothes.* For the same morbid condition of the animal system, which may cause persons to see the spectral prognostick, would, in this case, cause them to behold the subsequent phantom, and thus the omen and its awful consequence would be viewed together to the support of superstition. Besides this, the particular mode of burning observed in the wicks of lamps and candles, is really found to be caused by atmospherical peculiarities, and from it, a sure sign of Rain is frequently ascertained. I remember in the year 1819, on the eve of the Holy Innocents, that the wick of a candle, left for a long time unsnuffed, had, by degrees, assumed a completely cruciform shape, which being viewed by the common people a standing up amidst the

* The ocular spectra of children, who go to bed with too full stomachs or with irritable nervous systems, are to be referred to modifications of the real impressions of objects seen in the day time, such as the passage of uncouth faces by the bed at night. The forms of specks and freckles, which pass in imagination before us with closed eyes at night, and which continually change their shapes, are referable to the previous impression made on the retina and its auxilliary nervous parts, by accidentally beholding the figured paperings of rooms or the patterns of printed calicoes during the day.

gloomy light of the candle was fearfully set down by them as a memento of the sufferings of Jesus Christ on the Cross, who, as they fancied, mysteriously declared thus again by appearing in a flame—*I am the light that lighteth every man that cometh into the world.** The fearful appearance of this phaenomenon was rendered more impressive to the minds of the credulous, in consequence of its happening on the Vigil of Childermass, which has been ever regarded a day of unlucky omens.†

The Pythagorean doctrine of the Metempsychosis, or transmigration of souls, appears to have been derived originally from contemplating the perpetual revolutions and changes of figure performed by elementary atoms. The easy

* Excessively cold weather followed in January, 1820. On the 14th of that month, the Quicksilver in my Thermometer fell to -5° at eleven o'clock at night. Another Thermometer was also observed, hanging in a window in the house, to be likewise much below Zero. At the same time and during the night, I ascertained by a Six's Thermometer, that the cold had been -10° , that is ten degrees below O of Farenheit's Scale, or forty degrees below the freezing point. This extraordinary degree of cold appeared to be partial, and to occur in a particular line of places, as if a stream of excessive cold existed.

† See *Brand's Pop. Antiq.* under CHILDERMAS DAY.

transition, in a mind endowed with imagination, from the metamorphoses of those substances with which we are acquainted, to those whose nature is hidden, is well exposed by Ovid, in the beautiful oration which he has put into the mouth of Pythagoras; and some of the allusions to the changes and shades of colour in atmospheric phaenomena contained in this speech, are particularly elegant and natural.*

* “O genus attonitum gelidae formidine mortis,
 Quid Styga, quid tenebras, quid nomina vana timetis,
 Materiem vatum, falsique piacula mundi?
 Corpora sive rogos flammâ, seu tabe vetustas
 Abstulerit, mala posse pati non ulla putetis.
 Morte carent animae: semperque, priore relictâ
 Sede, novis domibus habitant vivuntque receptae.”

Which he tries to illustrate by reference to the perpetual changes of atmospheric atoms.

“Cernis et emersas in lucem tendere noctes:
 Et jubar hoc nitidum nigrae succedere nocti.
 Nec color est idem coelo, cum lassa quiete
 Cuncta jacent media, cumque albo Lucifer exit
 Clarus equo: rursumque alius, cum praevia luci
 Tradendum Phoebo Pallantias inficit orbem.
 Ipse Dei clypeus, terrâ cum tollitur imâ,
 Mane rubet: terrâque, rubet, cum conditur imâ.
 Candidus in summo est; melior matura quod illic
 Aetheris est, terraeque procul contagia vitat.
 Nec per aut eadem nocturnae forma Dianae
 Esse potest unquam: semperque hodierna sequente:

There is a vulgar error respecting the substance found about plants, called Honeydew,

Si crescit, minor est ; major, si contrahit orbem.
 Quid ? non in species succedere quatuor annum
 Aspicias aetatis peragentem imitamina nostrae ?
 Nam tener, et lactens, puerique simillimus aevo
 Vere novo est. Tunc herba nitens, et roboris experta
 Fitque valens juvenis. Neque enim robustior aetas
 Ulla, nec uberior ; nec, quae magis aestuet, ulla est.
 Excipit Autumnus, posito fervore juventae
 Maturus, mitisque inter juvenemque senemque ;
 Temperie medius, sparsis per tempora canis.
 Inde senilis Hyems tremulo venit horrida passu ;
 Aut spoliata suos, aut, quos habet, alba capillos."

Again he observes :—

"Quatuor aeternus genitalia corpora mundus
 Continet. Ex illis duo sunt onerosa, suoque.
 Pondere in inferius, tellus atque unda, feruntur :
 Et totidem gravitate carent ; nulloque premente
 Alta petunt, aër, atque aëre purior ignis.
 Quae quanquam spatio distant ; tamen omnia fiunt
 Ex ipsis, et in ipsa cadunt. Resolutaque tellus
 In liquidas rorescit aquas : tenuatus in auras
 Aëraque humor abit : dempto quoque pondere rursus
 In superos aër tenuissimus emicat ignes.
 Inde retro redeunt ; idemque retexitur ordo.
 Ignis enim densum spissatus in aëra transit ;
 Hic in aquas ; tellus glomerata cogitur unda :
 Nec species sua cuique manet. Rerumque novatrix
 Ex aliis alias reparat Natura figuras.
 Nec perit in tanto quicquam, mihi credite, mundo,

into which M. White, the naturalist of Selborne has fallen, namely, that it is the mellific secretion from flowers taken up into the air in sultry weather, and deposited again with the descent of the Fallcloud at eventide. In proof of this notion, we are referred to the sweet and honied smell of the air in close still warm summer weather. The fact, however, is, that the substance alluded to, is the nidus of a species of aphis, which, in certain weathers, infests plants. A similar substance is called Woods-eare, which likewise occurs in weather favourable to its existence.* But it has nothing to do

Sed variat, faciemque novat : nascique vocatur.
 Incipere esse aliud, quam quod fuit antè ; morique,
 Desinere illud idem. Cum sint huc forsitan illa,
 Haec translata illuc ; summa tamen omnia constant.
 Nil equidem durare diu sub imagine eadem
 Crediderim. Sic ad ferrum venistis ab auro,
 Saecula. Sic toties versa es, Fortuna locorum."

The Transmigration of Souls is still a doctrine of some of the East Indian Religions.

* Why this substance and its appropriate insect should at particular times come forth and be produced in such abundance, is like the cause of blights on the occurrence of East Wind, the intestinal vermes, in peculiar disorders of the bowels and the sudden appearance of parasitical animals and plants in general, to be regarded as one of the *arcana naturae* hitherto unravelled by philosophic sagacity.

with the aërial perfumes of Summer, which arise from a property in the calm air, at particular times, of retaining all effluvia longer than usual. The same would occur in Winter, if there were flowers to scent it. And I have generally been able, by observing whether or no the smoke from my pipe staid long in and scented the circumjacent air of a morning, to prognosticate a good or a bad scenting day for hunting.

This subject, of the hanging of gaseous substances in the air, leads me again to the consideration of Meteors which result from the combustion of low exhalations, such as Will o' the Wisp, the Fire Drake, and others, concerning which there are many vulgar prejudices.

The larger Meteors were called Flying Dragons, and numerous vain and fallacious prognosticks were deduced from their appearance.*

* An artificial flying Dragon appeared by day light some years ago, during the celebration of some great public festival in France, which had the express form of this creature of the terrified imagination. It has never been discovered what this extraordinary moving monster really was; but it has been supposed to have been some kind of firework. I remember seeing an authentic and original picture of it at the late M. Richard Gough's, at Enfield.

The many superstitions relating to flying gossamers, and other productions of this sort, would swell a large volume, and form a disproportionate appendage to a work on meteorology.* In illustrating the physical cause of these, and in tracing the origin of the superstitions conjoined with them, we must always remember how much matter for supernatural wonder fortunate coincidences can add to physical facts, and how frequently some particular accident will give rise to a whole train of fables.†

And the extraordinary ascendancy and dominion over the mind, which particular prejudices of this kind will sometimes get, forms a very interesting subject in the Natural History of the Human Understanding.

Among meteorological delusions, may be noticed the strange figures of Dragons, and other hideous creatures, which a roving imagin-

* See many in Pointer's *Rational Account of the Weather*, London, 1778. And many remarkable recorded cases in A Chronological History of the Weather, 2 vols. 8vo. London, 1749.

† "It is a wonder, since almost every thing has been written on, that there has been no distinct treatise on that most curious subject—COINCIDENCES."

ation often sees in certain clouds of fanciful and grotesque appearance, and which is well described by Erasmus, in one of the dialogues, in that fund of entertaining and snug reading, his *Colloquia*.

An atmospherical delusion, of a novel kind, is recorded as having happened some years ago at Florence:—a Fallcloud of shallow depth, but very intense where it prevailed, intercepted the view of the dome of one of the churches from the spectators in the street, while the gilded image at the top was left exposed to view: the consequence was, that the populace seeing the bright form of an Angel through the mist, which just then began to be thin enough to admit of her being seen, ascribed the appearance to the real descent of some such celestial being, and a large crowd of persons assembled in the street, and continued there, in the plentitude of admiration, till the beams of ascending Apollo at length dispelled together the fog and the illusion. Had the fog continued till night, there is no saying what new miracle might not have been recorded, as the testimony to the phenomenon was both numerous and respectable.

Moonlight shades, cast on a thick fog, have frequently the appearance of being upright;

and many curious cases are related of persons who have mistaken them for ghosts, and who have literally ran terrified away from their own persecuting shadow. The imagination in these cases often supplies the deficiency of form which is necessary to give consistency to the appearance, and to embody the dusky spectre with the awful form of a ghost.

The consideration leads directly to the subject of spectral illusions in general, and to the investigation of the physical causes of those phantoms which, in all ages and countries, are recorded as having appeared to certain individuals. We have no good reason for thinking that the apparition which appeared to Brutus, nor the well known fearful spectre which admonished a certain late noble Lord of the time of his death, nor the many inspiring visions of Angels, and Crosses, and the appalling forms of Daemons, which divers persons have seen, had any real existence. Physiology naturally induces us to refer them to the class of ocular spectres, and other hallucinations of the organs of sense and their corresponding organs of the brain; and this explanation is rendered more probable, in proportion as we examine into their history, and the health of persons who

have been the subjects of such deceptions. Moreover, persons who are much endowed with a poetic and mystical disposition of mind, are most subject to these illusions. It has been constantly observed by phrenologists, that those parts of the brain considered to be the organs of ideality and of supernaturality, but particularly the latter, exercise an influence over the intellectual organs, (in which the objects of the external world are perceived) of such a nature, as to induce those organs to act irregularly, and thus to call up ideas of recollection with a force and vividness seldom surpassed by real impressions. By these means a spectrum is produced, which, unless carefully compared with real objects by which it may be surrounded, is capable of deceiving the beholder into a belief of its absolute existence. Novel combinations of form are sometimes produced in this manner, by the internal activity of the organs of the brain, and thus we occasionally seem to behold figures which have no external prototypes in the material world.*

* It should be remembered, that we never see any external objects in themselves, we only perceive the configurations of our organs, which the impression of the objects create: and this, in fact, must be continually kept in view, when we en-

Persons with an imagination disturbed by fever, and by disorders of the digestive organs, have seen these phantasms in their chambers at night, and have compared them with surrounding objects which have appeared more vivid, and also with common ideas of imagination which have seemed less vivid; and by this comparison they have been enabled to determine them as holding a sort of intermediate rank between common imagination and real objects. Those haunting creatures, called Blue Devils, afford an example of this kind.

Sometimes other organs of sense, as for example, those of hearing and of touch, perform similar delusive actions; and in a few cases where the contemporaneous hallucinations of several senses have been combined, the spectre has appeared accompanied with the highest proofs of its reality. Dr. Ferriar has published some interesting illustrations of the nature and cause of these sprites, and justly observes, that the mythology of the ancients was highly calculated to favour the indulgence in such illusive phan-

deavour to explain phantasms of the mind. I must refer the reader to a small work, entitled, SOMATOPSYCONOLOGIA, or BODY, LIFE, and MIND, published by R. Hunter, London, 1823, ch. ii. § 3.

toms. The habit of constantly dwelling on the images of saints and crosses, has done the same thing in Christian Europe, which the fables of Jupiter, Venus, and other deities, did in ancient Greece and Rome, and which the fairy mythology of the northern nations had effected in the septentrional parts of Europe and Asia. But when we have developed their physical causes, we have not done all that seems requisite to found the history of what are called supernatural apparitions. Some such remarkable coincidences between these phantoms, and certain real events to which they professedly related, have occurred from time to time, and are recorded with such accuracy of testimony, that they seem to deserve a larger share of attention than has usually been bestowed on them by philosophers. As far as their physical history goes, dreams, nightmares, and many other familiar phaenomena are referable to a common origin, and depend on established laws in the animal economy.* But the most

* A fallacious argument was attempted by Baxter, in plea of his doctrine that dreams and visions were presented to us by external agents, founded on the fact that we feel *surprise* in our dreams at the strange appearances which present themselves, which could not be the case if the mind itself of the dreamer produced the images. This circumstance,

curious part of their history relates to coincidences connected with them. If correct accounts of the various superstitions, such as I have related in the three foregoing sections, accurately compiled and compared with their causes, were published, they might clear up many idle tales and superstitious opinions, and show the origin of

“—— a thousand fantasies

Of calling shapes and beckoning shadows dire

And airy tongues which syllable men's names

On shores and sands and desert wildernesses.”

Any person capable of the task of compiling such a stupendous work would, by clearing up many idle fables, prepare the way for the march of science, and the promulgation of useful knowledge.

however, has been explained of late years by the multiplicity of organs in the brain, whose spontaneous activity produces forms, which the mind mistakes in sleep for realities. But this explanation also shows, that the organs themselves are not the mind, and that there is some identical percipient independent of those parts of the brain which produce the illusion. Again, the character, origin, and specific object of certain visions must be drawn, not from their individual peculiarities, but from the coincidence found to exist between these and certain events in real life. These subjects constitute, perhaps, the most curious and interesting part of Physiology and History which exist, a circumstance that must plead my apology for detaining the reader so long with their consideration.

APPENDIX.

C. 1. § 4.—THE sudden and dense fogs which come on sometimes seem hardly referable to any assignable cause. In great cities, the fog, whatever may be its cause, aggrandized and thickened by smoke, and the breath of the inhabitants, often envelops the whole town in such darkness, that people are obliged at mid day to go about their business by candle light. Of this, I select the following instance from M. Howard's Journal, which happened on the 10th January, 1812:—"London was this day involved, for several hours, in palpable darkness. The shops, offices, &c. were necessarily lighted up; but, the streets not being lighted as at night, it required no small care in the passenger to find his way, and avoid accidents. The sky, where any light pervaded it, showed the aspect of bronze! Such is, occasionally, the effect of the accumulation of smoke between two opposite gentle currents, or by means of a misty calm. I am informed that the fuliginous cloud was visible, in this instance, from a distance of forty miles. Were it not for the extreme mobility of our atmosphere, this volcano of a hundred thousand mouths would, in winter, be scarcely habitable!"

An account of several remarkable circumstances attending particular fogs may be found in Bertholon. *Elec. des Meteors:*

also an account of the remarkable fog which overspread part of Europe in 1783. See vol. ii. 128. of the above work, *sur l'Extraordinaire Brouillard de 1783*.

C. 2. § 7.—A disposition in the air sometimes to form rain, without the precurrence of the modifications, may be deduced from the drops of rain which sometimes fall without any visible clouds, even when the sky is clear. The drops, probably, acquire size in falling.

C. 2. § 11. *Hail*.—It is a question, Whether hail results merely from the coldness of the atmosphere in which the nimbus pouring it exists, or whether some other causes may not be deemed necessary? Certainly there is a difference in the general appearance of the cumuli, cumulostrati, &c. which precede hailshowers, and showers which only effuse rain. The Abbé Bertholon has observed, that hard hailstorms are generally accompanied with thunder and lightning, and that the loudest thunder generally happens when the hail has been greatest. “La tonnerre gronda, sans interruption, pendant la chute du fameuse grêle observé par M. de Ratte à Montpellier, le 30 Janvier, 1741. Il en a été de même dans une grande nombre d'autres circonstances.” *Elect. Met.* ii. 195. ch. *sur la Grêle et le Gresil*. In the same work, vol. ii. cc. 6 and 7, the author has treated amply on the peculiarities of hail and snow.

C. 5.—To ascertain that our health is influenced by atmospheric peculiarities, is a discovery of little practical utility, unless it enables us to provide an antidote against their effect. The difficulty of guarding against such disorders as seem to be caused by the state of the air, must appear manifest to all who consider the obscurity which hangs over this subject, both as to the peculiar quality of the air which excites the disorders, and as to the state of constitution of

the patients in whom they may occur. As we do not know the nature of the specific stimulants which excite many atmospheric or other diseases, nor any particular counteracting antidotes, in medicines, we must be content to prescribe a general mode of conduct to those in health, which, by preserving a strong and tranquil condition of body, may avert or mollify the influence of the atmosphere on the constitution, and to endeavour to restore those already disordered, by measures that are generally known to conduce to such a state of health. It may not, therefore, be entirely foreign, to the present subject, to discourse briefly on the mode of preserving the healthy, and of rectifying the disordered, actions of the animal machine. Early rising, good air, and exercise, freedom from care and anxiety, and temperance of appetite, have been from time immemorial the popular receipts for health and longevity; but the quantity of exercise necessary, the quantity of our food, and the periods of taking it, and its quality, which involves the question of natural diet, must be submitted to a more accurate and physiological scrutiny, which may, in a great measure, explain the ill success of many who labouring under disorder, yet think themselves entitled to health from the observance of an imagined course of temperance. Exercise should be taken to a considerable degree, but by no means when the stomach is full. Various experiments have long ago established it as certain, that digestion is never so well performed, as when a meal is followed by rest; and carnivorous animals, and, indeed, all those who take in their food in any quantity, rest or sleep after their repast. Exercise, under favourable circumstances, seems to give vigour to the whole system; and strength appears, to a certain degree, to be commensurate to bodily exertions, and health and spirits are the consequence. Indeed

few persons know how rightly to appreciate considerable and constant exercise in the open air as a medical agent and preserver of health. But it is probable, that the same vital energies, which are concerned in all the movements of muscular activity, and of thought, and which customary language has ascribed to the brain and nervous system, are engaged after taking our food in the work of digestion. And it has been found, conformably to this notion, that exertion after meals has interrupted the chylopoietic processes, and has caused unpleasant feelings in the stomach, and subsequent weakness. Great mental exertions, or anxiety, have had the same effect. The gentle stimulus of company after dinner, may, perhaps, be beneficial, by assisting to produce those nervous energies, which hard exercise might dissipate among the muscles at a time when they ought to be spent on the stomach, that that organ might pour out sufficient of the gastric juice to convert the alimentary matter into chyle, and subsequently on the liver, pancreas, and secretory coats of the intestines; that by the after aid of their proper fluids, the chyle may be properly formed for absorption and nutriment. Exercise, while these processes are going on, may be regarded as an interruption to them: though, if used several hours after eating, it appears often to assist the peristaltic action of the intestines.

The food is the next subject of consideration. It has been often said, that, in a natural state, the quantity and quality of our food would be regulated by desire and opportunity: but as we know little about man in a natural state, we must regulate our diet by the experience of what is best in a state of artificial society. Physiologists have laid great stress on proportioning the quantity of food to the power of the stomach; and it is rational to consider, that what is not

digested, will irritate the surfaces of the alimentary canal, and cause many sympathetic diseases. Hunger is, in health, the general criterion of the power to digest ; but, in disorder, as M. Abernethy has observed, the uneasy feelings of a weak stomach are often mistaken for it.

Custom has, in artificial life, appointed meals at certain stated hours ; a practice which does not appear to have arisen wholly from economical convenience, but which may have been established, partly in order to embrace the beneficial results of conviviality, which consist in the pleasurable sensations, and, perhaps, better digestion, occasioned by cheerful company during and after meals. The wassail bowl, though abused by posterity, was, probably, suggested by the sagacity of our forefathers, as a salutary pleasure. The periods of eating should not come too near together. People fall into a mistake often by supposing that persons with weak stomachs should eat little, and frequently ; whereas they ought really to allow considerable time for the digestive organs to recruit their strength. And many who for ill health have tried various kinds of food without success, have found great benefit from a long fast before dinner. Of the quality of food proper for man, much has been said and written by physicians in all ages, and various have been their opinions. Many have enjoyed good health who have subsisted entirely on a vegetable diet ; while others have grown weak, and have not been sufficiently nourished by it. In some particular diseases patients have not been able to eat vegetable food, and in others animal food has appeared injurious ; but we must not draw our conclusions of the wholesomeness of any particular food from its effects on diseased subjects. There are many idiosyncrasies which must be regarded as exceptions to general rules : some persons cannot eat honey, others butter, others

other things, without being ill. There are persons who can eat all meat but mutton which never digests with them. It may be proper to consider, first, what sort of food is best in health: and, secondly, what may be the medical influence of different changes of diet in cases of disorder. With regard to the first of these questions, little enough can be expected from any hypothesis of the cause of diseases. It is a question to be solved by an accurate examination of facts. We cannot even place much dependence on the analogy of the human structure to that of any other animal; for though the structure of the human organs of digestion most resemble those of carnivorous animals, yet the monkey tribe, which, in many respects, approach nearest in their nature to man, live on vegetable substances. Several writers of physiology have asserted, that those persons who feed on a mixture of animal and vegetable food are stronger and more active than those who subsist entirely on vegetables; while the advocates for a pure vegetable diet contend, that it produces more tranquillity, and even a more mild and amiable character. These two assertions are by no means irreconcilable, and agree very well with experiments and observations that I have made, which have had a tendency to show that animal food produces more muscular strength and energy, but, at the same time, renders the body more susceptible of irritation. When, to patients who have long subsisted on vegetable food, flesh has been superadded, the pulse has become quicker, the muscular motion more quick and lively, the countenance more highly coloured, and the spirits exhilarated. These effects are strikingly conspicuous just after the adoption of the meat, and illustrate the greater degree of stimulus afforded by animal food: and the contrary effects often appear on first taking to vegetables alone. But after a time, in either case, a very

similar state of health often returns: a fact which illustrates the great power of accommodation to circumstances, which the human constitution possesses.

But though there be persons enjoying health on each diet; yet, upon the whole, the mixed diet seems to agree best with the majority, and also to produce rather more strength and vigour. But whether health maintained on a mixed diet be equally lasting, or whether it may not eventually lead to disease, is a question to solve which accurate experiments are as yet wanting. It has been said by those who contend for a vegetable diet, that, being natural, it conduces to a more perfect form of body, and greater degree of intellectual power. The assertion, however, seems not to be supported by facts; for the ancient Greeks, who may be admitted as examples of the more perfect forms of our species, and who possessed a clearness of intellect, and vigour of imagination, superior to their neighbours, appear to have lived on a mixed diet; whereas the inhabitants of part of India, who subsist wholly on vegetables, are very far from either bodily or mental excellence.

For the medical advantage of vegetable diet, much more may be said than for its common use. To illustrate the view I have of this subject, I must observe, that the effect of animal food seems to be that of increasing all the vital energies, or actions, of the animal machine: while a person is in health, when these actions are natural, to increase them is to augment the strength and power of the animal: but, in diseases where there are morbid actions, to increase them is to aggravate the disease. It is probably on a similar principle that vegetable diet and distilled water are useful in diseases, where the diseased actions seem as fully established as the natural ones, as in cancer, for instance. Besides this, in common and more

trifling cases, a mild diet may become a useful alterative, and, by alleviating the irritation of the chylopoietic organs, may subdue numerous sympathetic diseases, which accompany a disordered state of the viscera. The lowering of the animal actions by vegetable food has sometimes disposed me to differ from those who regard animal food as equally conducive to longevity, and to incline to the fanciful opinion of others, who have regarded the vegetable diet of the early ages as the cause of the Patriarchal longevity, as if man lived longer by living slower. All reasoning of this sort must, however, be very vague and conjectural. The question, whether the animal system wears out sooner in proportion as it is stimulated to action, either by animal food or any thing else, provided that stimulus does not proceed to cause actual disease, must rest entirely on experience. There are some remarkable instances of men, of what is commonly termed genius, that were characterized by perpetual activity of thought who have died prematurely; but there are several means of accounting for this. Men of genius are men of great sensibility, who are frequently led into excesses in eating and drinking, particularly the latter, which shortens their lives. Indeed, the stimulus of wine and spirits, so uniformly destructive, seems, in a great measure, conducive to the enterprizes of genius. By exciting a system, already highly susceptible, into violent action, it gives, for a time, a flow and vigour to thought, but which is ultimately exhausting. Such persons seem to keep up an habitual state of excitement, similar to that which ordinary persons occasionally make use of, previous to any unusual mental exertion, who take drams as a stimulus. After all, notwithstanding the violence of stimuli is lessened by habitual use, from the diminution of excitability, it is doubtful whether the moderate stimulus of animal food actually

hastens dissolution. Old Parr and Jenkins do not appear to have fed on a vegetable diet ; and the longevity of Cornaro seems to have depended more on his moderation in diet, than on the quality of his food. Animal food is certainly as easily and as soon, if not sooner, digested : and to state the question of diet fairly, would be to say, in cases where from the healthy state of the digestive organs, the chylopoietic functions go on perfectly, what difference is subsequently observable between the effects of the mixed, and those of the purely vegetable nutriment ? I was once inclined to attribute much good to the vegetable regimen as general diet ; but subsequent experiments and observation have made me somewhat sceptical on this point. Animal food appears to afford more nourishment, in proportion to its volume, than vegetables. There may, perhaps, be minute differences in the quality of the blood, arising from different kinds of food, which evade all chemical tests ; but, as we know nothing of these, we ought not to be deluded by hypothetical arguments on the subject. As the digestive processes are those of assimilation, the blood seems more likely to be deteriorated by bad chylofication and absorption of unassimilated matter, arising from disorder in the organs, than from the quality of the aliment, when the stomach is healthy. In disease, the blood may be altered in composition, from various sources ; the liver and other secreting organs not giving out their proper fluid, and these remaining in the blood may alter its properties, and increase and render compound the evil of sympathetic irritation.

To preserve health, of which we are in actual possession, and to cure disorders when once established, are certainly very different things : in the latter case, various kinds of diet, like medicines, having specific actions arising from the nature of the disorder, particular regimen may become necessary, in

some particular complaints, which it is foreign to the purpose to discuss here: but, in general, the treatment of diseases seems more simple than is usually imagined. As the secondary and outward symptoms of diseases are infinitely numerous and dissimilar, both as to their local effects on the body, and as to their influence on the mind, arising from varieties of constitution and other circumstances, the only rational and simple mode of treating them seems to be, to find out, if possible, whether, among the multiform symptoms, there be not some circumstances common to all diseases, and which are the distinguishing marks of disorder in the system. The ancients seem to have pursued and acted upon this simple mode of investigation: and perceiving a manifestly disordered state of the digestive viscera to accompany the more obscure irregularity in the nervous actions, had recourse to remedies which had known effects on those organs; and they treated successfully the more apparent mental diseases, by rectifying the state of the viscera. The manner, the mind, and nervous system, and the digestive organs, mutually aggravate each other's disorder; and the insufficiency of local remedies in general, for the cure of local diseases, has been ably illustrated by physiologists of late; which illustration may be regarded as the only important progressive step the science of medicine has taken since the time of Hippocrates. These opinions seem spreading on the Continent, as may be learnt by the works of the French physicians, Hallé, Cabanis, Pinel, and others. Dr. James Hamilton, Dr. Curry, Dr. Cheyne, Dr. Wilson Phillip, and some others, have, in this country, illustrated the connexion between the unhealthy state of these organs and diseases in general: and M. Abernethy, the perusal of whose surgical works first induced me to consider these subjects accurately, has shown the great suc-

cess of the constitutional treatment of local diseases ; and has treated in a very scientific manner of the disorders of the constitution, in which they originate, and of the mode of treating them ; to which works I refer the physiological reader.

I cannot help observing, in conclusion, that the pursuit of this subject strongly impressed me with sentiments of its importance, in a moral point of view. For if disorders in the digestive functions, which are so easily occasioned, and which are remediable by early attention, be capable, by getting ahead, of exciting the system in such a manner as to produce innumerable forms of bodily disease, and frequently to affect the operations of the mind ; considering how general are these disorders, and the mistaken habits which produce and aggravate them, we cannot but regard them as principally efficient in producing the quantity of intellectual depravity, which is so widely conspicuous ; and by weakening the mind, and perverting the character, as impeding the progress of science, and the advancement of truth. That the air, which seems to affect such great changes of the blood in the lungs, should, when its quality is peculiar, by affecting those organs and the skin, cause great changes in the whole system, is no matter of wonder ; but surely all these effects must be greatest on a weakened and disordered constitution. The way, then, to become prepared against atmospheric influence, is to tranquillize and invigorate the constitution by a systematic plan of temperance, founded on physiological views of the nature and office of the chylopoietic viscera, and of the connexion of their disorders with those of remote organs, and of the system in general ; and, at the same time to adopt habits of seasonable exercise abroad, and to enhance, by moral discipline, an habitual state of mental tranquillity, to which such habits

tend. For by joining measures, which seem primarily to ameliorate the condition of the nervous system, with those which more directly regulate the chylopoietic organs, we place the functions of the animal system in a state the most favourable to health, which gives the greatest scope and range to intellectual exertion, and which fortifies the body best against the numberless diseases which the varieties of climate, and of atmosphere, may have a tendency to produce on the various degrees of strength and the peculiarities of organization of different individuals.

The reader who wishes to pursue further the effect of atmosphere on health, may consult *Cabanis Rapport du Moral et du Physique de l'Homme*. 2d vol. pp. 1. 161.

C. 6.—There are some circumstances about winds very remarkable, and which seem inexplicable on any hitherto invented hypothesis. The gusts of wind, in some high windy weather, seem to fluctuate in a manner somewhat analogous to the undulatory motion of waves. This fact may be easily seen by a pendulous anemometer. When the wind is accompanied by the rain, the periods of the gusts may be counted by the intervals of the more or less violent impulse of the water on the windows opposed to the wind, or leaves of any tree twined across them.*

In the *Phil. Trans.* vol. xlviii. 1. is related a curious instance of a violent gust of wind, which succeeded a flash of silent lightning, and came from the same quarter.

Winds.—Refer to D'Alembert's *Reflexions sur les Causes Générales des Vents*, and to several papers in *Phil. Trans.*

* The philosopher watching this, as he lies in bed by night, must be very careful to preserve his vigilance, as it is a most soporific sound. No lute of Mercury, or Aeolian harp, is more lulling to the Argus eyes of the student.

The number of different currents blowing at the same time at different altitudes, is a circumstance I ascertained by the following experiments:—On the 25th Oct. 1809, an inflammable air balloon was launched from Clapton, in Hackney: the balloon was made of varnished paper, quite water proof, three feet six inches in diameter, and filled with inflammable gas. The process of filling it was begun at one o'clock in the afternoon; and by about ten minutes after two, the balloon appearing sufficiently inflated, a small paper parachute was attached to the bottom of it, by means of touch string. It was now found that the buoyant power of the balloon was just sufficient to carry the appendage. Upon the touch string being lighted, the balloon was launched into the air. At first it ascended very slowly in a direction nearly W. N. W. and in less than a minute dropped the parachute, which fell into the brick field opposite Hackney New Church. The balloon now ascended more rapidly in the same direction for several minutes, when, being very high, it met a different current of air, and was observed to travel nearly towards the South: this was ascertained by the balloon's getting much more southward without increasing or diminishing in apparent magnitude, which it would have done, if it had taken a course either much to the East or the West of the South. In a few minutes more its course was again altered by a third current of air, which carried it in a direction apparently N. E., when it passed again over the northern part of the parish of Hackney, and was distinctly seen from the place of its ascent. At about twenty minutes before three, it was blown by a fourth current nearly N. N. W. by N. Thus there appear to have been four different currents above one another, namely, E. S. E.—N.—S. W. and S. S. E. by S. It very soon became invisible to the naked eye, but was discerned through a

telescope till about ten minutes before three, when the person who set it up observed it to sink very rapidly, after which it was no more seen.

At the time the balloon ascended, the mercury in the barometer, 30 feet from the surface of the earth, stood at 30. 28. Thermometer (Fahrenheit) $57\frac{1}{2}$. Hyg. 0. 5. Wind variable and very gentle: a few clouds in the sky of the modification of cirrus.

The air balloon fell at five minutes before five, the same day at Wilbraham, near Cambridge. The sudden diminution of the angle of its altitude, which has been called its sudden descent, could not be occasioned by any rent in the balloon, since it afterwards travelled nearly fifty miles. At ten minutes before three it appeared in the telescope to be well distended: it is therefore probable, that at that time it had attained its greatest elevation. Its motion was, therefore, horizontal; and it being about twenty five miles in the hour, and direct from the eye of the observer, it would, without any descent of the machine, occasion a rapid alteration of the angle subtended by the line of its perpendicular altitude. The diminution of the angle being rapid in proportion to any other observation, it was concluded that it must have been at that time descending, because we could not at that moment know the velocity of the current, which the time and place of its descent have since proved to be very great.

A small balloon launched the same day went uniformly in the same current of air. Since the above, I have made upwards of thirty experiments with air balloons, some filled with inflammable gas, and then with rarefied air. Some few of them have gone uniformly with one direction, but most have indicated four or five, and some seven or eight, different currents of wind: the currents below, too, have several times

acquired successively the direction of those which had previously blown above.

C. 7. *Electricity*.—Though the ancients might be unacquainted with the science of artificial electricity, yet they appear familiar with many electric phaenomena, as observed by M. l'Abbé Bertholon, in his *Ouvrage de l'Electricité des Meteors*, 2 vols. 8vo. à Lyon. 1787, vol. i. p. 67. The same author refers to a Dissertation, by M. Ostertag, *De Auspiciis ex Acuminibus*. Some observations on this head may be found too in the *Mem. Phil. Soc. Manchester*. Among other accounts I transcribe a part of the observation of the Abbé Bertholon, as follows: from his work above alluded to.

“ *Des Phénomènes d'Electricité Naturelle, observés par les Anciens*.—Quoique la découverte d'électricité du tonnerre soit toute récente, on en trouve cependant chez les anciens des traces si certains, et si sensibles, qu'on ne sauroit en douter avec fondement. Nous allons rapporter plusieurs preuves qui établissent cette assertion d'une manière irréfragable; elles sont appuyées sur des faits qu'on avoit eu de la peine à expliquer avant la connoissance de l'électricité atmosphérique. Hérodote dit qu'on pouvoit, il y a plus de deux mille ans, attirer la foudre avec une pointe de fer! Selon cet auteur, les Thraces désarmoient le ciel de ses foudres en décochant des fleches en l'air, et les Hyperboréens en lançant pareillement dans les nuées, des piques amères d'un fer pointu. Ces usages sont autant de points qui conduisoient à la decouverte de l'électricité que les Grecs, les Romains, connoissoient par certains effets qu'ils attribuoient aux puissances célestes, comme M. Ostertag l'a prouvé très au long dans une dissertation de *Auspiciis ex Acuminibus*.

“ Au rapport de Pline, les annales font foi qu'au moyen de certains sacrifices, et de certains formules, on peut forcer

la foudre à descendre, ou du moins l'obtenir du ciel. Une ancienne tradition porte que cela a été pratiqué en Etrurie chez les Volsiniens, à l'occasion d'un monstre nommé Volta, qui, après avoir ravagé la campagne, étoit entré dans leur ville, et que ce fut leur proprerio, Porsenna, qui fit tomber sur ce monstre le feu du ciel. Lucius Pison, écrivain d'un grand poids, décrit au premier volume de ses annales, qu'avant Porsenna, Numa Pompilius avoit fait souvent la même chose; et que, pour s'être écarté du rit prescrit dans l'imitation de cette pratique mystérieuse. Tullus Hostilius fut lui-même foudroyé parmi les bois sacrés, comme de nos jours M. Richmann l'a été à Petersbourg, en répétant l'expérience de Marly-la-Ville avec trop peu de précaution. Tite Live rapporte le même fait de Tullus Hostilius. Les anciens avoient admis aussi un Jupiter Elicien, Elicium quoque accepimus Jovem. Jupiter qui, dans d'autres circonstances, étoit appelé Stateur, Tonant, Férétrien, avoit dans cette occasion le nom d'Elicien. Pendant la nuit qui précéda la victoire que Posthumius remporta sur les Sabins, les javelots Romains jettoient la même clarté que des flambeaux. Lorsque Gylippus alloit à Syracuse, on vit une flamme sur la lance. Gylippo Syracusa petenti, visa est stella super ipsam lanceam constitisse. In Romanorum castris visa sunt ardere pila, ignibus scilicet in illa delapsis: qui saepe, fulminum more, animalia ferire solent et arbusta, sed si minore vi mittuntur, defluunt tantum et insident, non feriunt nec vulnerant.* Suivant Procope, le ciel favorisa du même prodige le fameux Belisaire dans la guerre contre les Vandales.† On lit dans Tite Live, que Lucius Atreus ayant acheté un javelot pour

* Senec. Natur. Quaest. lib. i. cap. 1.

† Procop. de Bell. Vandal. lib. ii. cap. 2.

son fils, qui venoit d'être enrôlé parmi les soldats, cette arme parut embrassée, et jetta des flammes pendant plus de deux heures sans être consumée par le feu.* Plutarque, dans la vie de Lysandre, parle d'une apparence lumineuse qu'on doit rapporter à l'électricité : dans le chapitre trente deuxieme il fait encore mention de deux faits de cette nature. “ In Siliciâ militibus aliquot spicula, in Sardiniâ muro circumeunti vigilias equiti, Scipionem, quem in manu tenuerat, arsisse, et littora crebris ignibus fulsisse.” Les piques de quelques soldats en Sicile, et une canne que portoit à sa main un cavalier, en Sardaigne, parurent en feu. Les côtes furent aussi lumineuses, et brilloient de feux fréquens. Pline a observé le même phénomène. J'ai vu, dit-il, une lumiere sous cette forme, sur les piques des soldats qui étoient en faction la nuit sur les ramparts, vidi nocturnis militum vigiliis inhaerere pilis pro vallo fulgorem effigie ea—hominum quoque capiti vespertinis horis magno praesagio circumfulgent.† Cesar, dans ses Commentaires, rapporte que pendant la guerre d'Afrique, après un orage affreux, qui jetta toute l'armée Romaine dans le plus grand désordre, la pointe des dards d'un nombre de soldats brilla d'une lumiere spontanée ; phénomène que M. de Courtivron‡ a appliqué le premier à l'électricité. Rapportons ici tout au long le passage de Cesar. Vers ce temps-la parut dans l'armée de Cesar un phénomène extraordinaire, au mois de Fevrier : vers la seconde veille de la nuit il s'éleva subitement un nuage épais, suivi d'une grêle terrible ; et la même nuit, les pointes des piques de la cinquième légion parurent s'enflammer.

* Tite Live, livre xliii.

† Plin. Hist. Nat. lib. ii.

‡ Histoire de l'Académie, 1752, page 10.

“ Per id tempus ferè Caesaris exercitui res accidit incredibilis auditu, nempè vigiliarum signo confecto, circiter vigilia secunda noctis, nimbus cum saxeâ grandine subito est cohortus ingens; eâdem nocte legionis quintae cacumina sua sponte arserunt.”*—Tous ces faits que nous venons de tirer des anciens, prouvent qu’on a dit avec raison, que pour juger sainement des ouvrages des anciens, il faut penser qu’il y a beaucoup de fabuleux dans leurs histoires, et beaucoup de vérité dans leurs fables; que nous croyons trop facilement les premiers, et que nous n’examinons pas assez les secondes pour entirer les vérités utiles qu’elles renferment. Joignons ici d’autres faits analogues, observés par les modernes, qui tous prouvent l’indentité rigoureuse qui regene le tonnerre et l’électricité.

Sur un des bastions du château de Duino, situé dans le Frioul, au bord de la mer Adriatique, il y a, de temps immémorial, une pique dressée verticalement la pointe en haut : dans l’été, lorsque le tems paroît tourné à l’orage, le soldat qui monte la garde en cet endroit, examine le fer de cette pique, en lui présentant de près le fer d’une hallebarde (brandistoco,) qui est toujours là pour cette épreuve : et quand il s’apperçoit que celui de la pique étincelle beaucoup, ou qu’il y a à sa pointe une petite gerbe de feu, il sonne une cloche qui est auprès, pour avertir les gens qui travaillent aux champs, ou les pêcheurs qui sont en mer, qu’ils sont menacés du mauvais tems ; et sur cet avis tout le monde rentre. La grande ancienneté de cette pratique est prouvée par le tradition constante et unanime du pays, et par une lettre du P. Imperati benedictin, datée de 1602, dans laquelle il dit, en faisant allusion à cet usage des habitans de Duino :—“ Igne

* Caesaris Comment. de Bello Africano, cap. vi.

et hastâ hi mire utuntur ad imbres, grandines procellasque praesagiendas, tempore praesertim aestivo.* M. Watson rapporte, dans les Transactions Philosophiques,† que, selon plusieurs relations venues de France, M. Binon, curé de Plauzet, avoit assuré, que pendant vingt-sept ans qu'il y a résidé, les trois pointes de la croix du clocher paroissent environnées d'un corps de flamme, dans les grandes tempêtes ; et que quand ce phénomène s'étoit montré, la tempête n'étoit plus à craindre, le calme succédant aussi-tôt. M. Pacard, secrétaire de la paroisse du prieuré de la montagne de Breven, vis-à-vis le mont Blanc, faisant creuseur les fondemens d'un chalet qu'il vouloit construire dans les prairies de Plianpra, il survint un violent orage, pendant lequel il se réfugia sous un rocher peu éloigné, et il vit le feu électrique tomber à plusieurs reprises sur la tête d'un grand levier de fer planté en terre qu'il avoit laissé en se retirant.‡ Si on monte sur la cime d'une montagne, on pourra être électrisé dans certaines circonstances immédiatement, et sans appareil par une nuée orageuse, comme le sont les pointes des girouettes et des mâts, c'est ce qu'ont éprouvé en 1767, M. M. Pictet, de Saussure et Jallabert, fils, sur la cime du Breven. Le premier de ces sçavans, à mesure qu'il marquoit sur son plan la position de quelque montagne, en demandoit le nom aux guides qu'on avoit pris, et pour la leur désigner, il la montrait du doigt en élevant la main. “ Il s'appercut que chaque fois qu'il faisoit ce geste, il sentoit au bout de son doigt une espece de frémissement, ou de picotement, semblable à celui qu'on

* Lettera di Gio. Fortunato Bianchini. dott. medic. intorno un nuovo fenomeno elettrico, all. Acad. R. di Secinze di Parigi, 1758. Memoires de l'Académie des Sciences, 1764, page 408, et suiv.

† Transactions Philosophiques, tom. xlviii. partie 1. page 210.

‡ Voyage dans les Alpes, &c. tom. ii. p. 56.

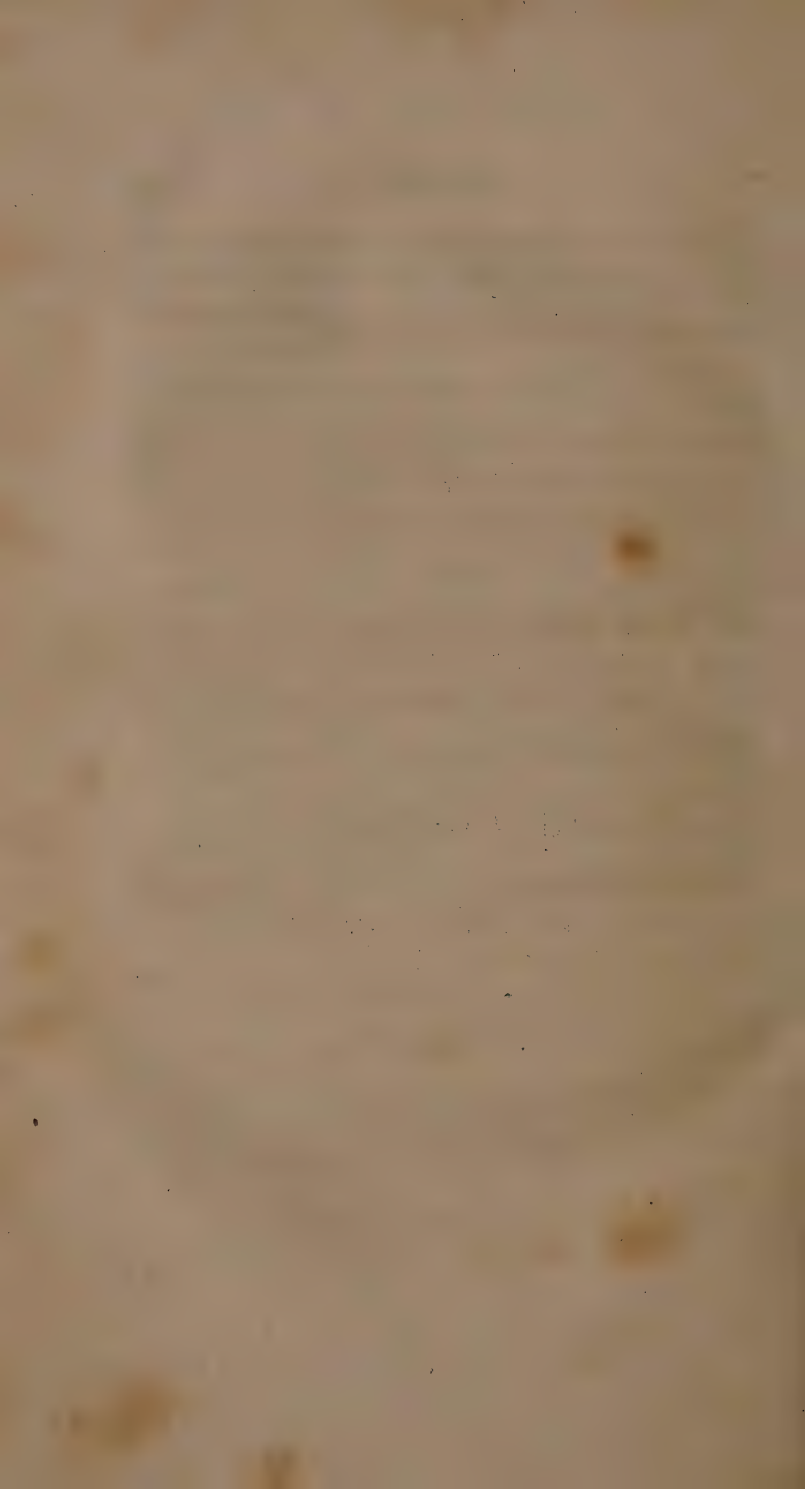
épreuve lorsque l'on s'approche d'un globe de verre fortement électrisé." L'électricité d'un nuage orageux, qui étoit vis-à-vis fut la cause de cette sensation. L'effet fut le même sur les compagnons et les guides du voyage; et la force de l'électricité augmentant bientôt la sensation produite par l'électricité, devint à chaque instant plus vive, elle étoit même accompagnée d'un espede de sifflement. M. Tallebert, qui avoit un galon à son chapeau, entendoit au tour sa tête un bourdonnement effrayant, que les autres personnes entendirent aussi quand elles mirent ce même chapeau sur les têtes.

On tiroit des étincelles du bouton d'or de ce chapeau, de même que de la virole de métal d'un grand baton. L'orage pouvant devenir dangereux, on descendit à dix ou douze toises plus bas, où on ne sentit plus d'électricité. Bientôt après il survint une petite pluie, l'orage se dissipa, et on remonta au sommet, où on ne trouva plus aucun signe d'électricité.*—*Berth. Elec. Met.*

P. S. M. Howard mentions a luminous appearance in the clouds, on the 31st March, 1812, as "an extensive appearance of light in the clouds to the West, with rapid corruscations passing through them, in the manner of an aurora borealis. This phaenomenon was apparently not more elevated than the cloud then occupying the sky, and was certainly not produced by a light situate below them. It continued twenty or thirty minutes."—*Nicholson's Phil. Jour. March, 1812.*

I refer the reader also to various accounts of the Feux St. Elme, and other curious electrical phaenomena, in *Bertholon Elec. Met.* above quoted.

* Voyage dans les Alpes, &c. tom. ii. page 55.—Histoire de l'Académie, 1767, p. 33.



SUPPLEMENT.

Calendar of Flora Fauna and Pomona compared with the Journal of the Weather, extracted from a Latin Journal, recording Observations of Seventeen Years.

1806, AT CLAPTON, MIDDLESEX, TILL 1817.—
AT TUNBRIDGE WELLS TILL 1818.—AT
HARTWELL, SUSSEX, *ad finem*.

MARCH 8.—A flock of Wild Fowls flew over towards the South East.

30th.—The Green Woodpecker *Picus viridis* seen in the garden.

APRIL 2d.—Two Swallows seen at Woodford, in Essex.

26th.—Swallows again appear in London Fields.

28th.—The Thrush singing.

MAY 1st.—The Wryneck *Jyx torquilla* first heard.

3d.—The Cuckoo first heard.

20th.—I noticed this evening, at Clapton, an immense quantity of small Flies flying in a vortex.

31st.—*Iris lurida* in flower.

JULY 4th.—The Cuckoo still heard: Strawberries very plentiful.

AUG. 10th.—Falling Stars numerous to-night.

OCT. 5th.—*Picus minor* seen.

29th.—Leaves begin to fall.

* 1807. APRIL 29th.—The Cuckoo heard, no leaves on the trees yet.

30th.—The Wryneck first heard.

MAY 1st.—Swallows as well as Martins first seen at Walthamstow.

9th.—The Sparrow has a brood in her nest under the gutter above my closet window.

10th.—The Raven flies high, indicating fair weather.

11th.—The Owls hoot in Walthamstow Grove.

16th.—The Swifts first seen and numerous.

JUNE 10th.—Blustering S.W. wind, quite shakes the house.

14th.—The Yellow Flag *Iris pseudacorus*, and the Lurid *Iris Iris lurida* in full blow.

JULY 2d.—The large White Poppy *Papaver somniferum* in flower.

SEP. 3d.—Swallows congregate as if about to depart.

OCT. 6th.—The Comet distinctly seen to-night.

18th.—*Viola odorata* still in blow.

NOV. 19th.—The first Snow fell to-day.

DEC. 2d.—The Snow lies thick: the birds come about the house for shelter and food.

* 1808. APRIL 18th.—The Swallow *Hirundo rustica* first seen at Barking, in Essex. From the 24th to the 29th no Swallows were seen, the wind being Northerly and cold.

MAY 1st.—The Wryneck first heard near Lea Bridge. The Martin *Hirundo urbica* seen.

14th.—The Swift *Hirundo apus* seen to-day in great numbers, as usual, at once.

21st.—A pale and lambent light of an electric kind was seen about the plants this evening, which I have already described in the foregoing pages.

29th.—I noticed Starlings at Hampton Court.

JUNE 3d.—The *Iris Germanica* in flower at Walthamstow. The Sparrow has young ones again in her nest above my window.

7th.—The Monkey Poppy *Papaver orientale* in blow at Clapton, but not yet at Walthamstow.

10th.—*Scilla Peruviana*, *Sarracenia purpurea*, and the Purple Goats Beard, *Tragopogon porrifolius*, in flower.

11th.—*Iris lurida* in flower.

20th.—The Monkey Poppy in flower in M. Forster's garden at Walthamstow. The Red Poppies *P. Rhæas* and *P. Dubium*; and also garden varieties of *P. somniferum* in full blow.

23d.—The *Scilla Peruviana* gone out of flower and bearing seed. *Lucanus cervus* frequently caught flying this year at Clapton, though not in general common like *Scarabæus fimetarius*.

24th.—*Sonchus coeruleus* flowering in the garden.

JULY 14th.—The weather for several days has been very hot; to-day the thermometer stood at 96° of Farenheit's scale, at Ryegate.

23d.—*Sonchus coeruleus* in seed.

27th.—Sparrows begin to congregate in flocks.

28th.—The Sunflower *Helianthus annuus* in blow.

AUG. 7th.—The Sparrow *Fringilla domestica* has a second brood in her nest over the window.

11th.—Martins congregate: Swifts departing fly high in the air in circles.

24th.—Although there be many Sunflowers in the garden, I could never observe their alledged property of turning round with the Sun.

25th.—The Goldcrest *Motacilla regulus* seen at Clapton.

SEP. 10th.—Large congregations of Martins noticed. Wil-
low Wrens observed in the Larch Trees at Walthamstow.
Marsh Titmouse seen.

11th.—I found in the garden at Clapton that rare Fungus
the *Tremella purpurea*. Water Wagtails congregate in flocks.

14th.—Martins alight and sit on the roof of the house.

19th.—*Mustela nivalis* crossing the Lea Bridge Road.
M. Benjamin M. Forster and myself found to-day in Wan-
stead Forest the following Fungi:—*Agaricus campestris*, *A.*
deliciosus, *A. stipitis*, *A. verucosus*, *A. fascicularis*, *A. integer*
purple, pale, and red varieties. *A. squmosus*, *A. amethistinus*,
A. farinaceus, *A. lactifluus*, *Boletus bovinus*, and several
others.

OCT. 14th.—Swallows last noticed by me at Chapel Field,
near Norwich.

18th.—Martins last seen.

NOV. 14th.—The Owl heard at midnight.

* 1809. JAN. 29th.—Extensive floods in the marshes of the
Lea. The waters were so much out at Hackney as to cover
the bridge over the brook.

APRIL 10th.—The Bat first seen ; it was caught flying in
the house.

28th.—I noticed the first Swallow at Colnbroke, in my
way to Bath.

MAY 1st.—I saw a vast quantity of torpid Bats in Wokey
Hole, near Wells.

5th.—The Martin seen at Melksham, in Wiltshire.

17th.—The Monkey Poppy *P. orientale* in blow in the
garden of T. F. Forster, Esq. at Clapton.

JUNE 11th.—*Scilla Peruviana* in full flower at Clapton : it
has been in flower about ten days.—Purple Goat's Beard in
flower. The Sparrow has young in her nest over my window.

22d.—Many varieties of garden Poppy *P. somniferum* in blow.

JULY 1st.—*Sonchus coeruleus* in flower: the brittle stalk of this plant this year as well as last, is broke, yet it bears perfect flowers.

3d.—The Wryneck still heard.

4th.—I noticed to-day the Swift flying during a hard storm: *Fringilla linaria* has a nest near a pool called the Bog at Clapton.

5th.—The Cuckoo still heard.*

AUG. 13th.—The last Swift seen at Tunbridge Wells.

SEP. 10th.—The Sunflower in full blow. The Red Poppy still flowers.

12th.—*Agaricus fascicularis* springs up at the base of the door post.

18th.—Frogs still very abundant in the bog.

21st.—Swallows and Martins still very numerous, as I had occasion to notice to-day, in consequence of a great quantity of them being assembled to persecute a bird of the hawk kind.

23d.—Swallows seen in St. Helen's Place, London. The garden *Convolvuli* still in flower.

OCT. 1st.—Martins fly high: Bat seen.—3d. Last Swallow.—5th. Spiders come out on the walls of the house portending rain.

16th.—Martins last seen at Hackney.

22d.—Wild Ducks in flocks in the marshes.

* An old Norfolk proverb says:—

“In April the Cuckoo show his bill,
In May he sing night and day,
In June he change his tune,
In July away he fly,
In August away he must.”

NOV. 13th.—I made about this time numerous experiments on the direction of the wind, with inflammable air and fire Balloons, of which the results are recorded in this work.

DEC. 10th.—The Crickets about the fire place very clamorous; a few leaves still left on the Pear Tree.

19th.—I find the following observation made at night, recorded in my Journal: “*Audio aliquid stridens in aëre, sed nescio quid sit, fortasse mus est in muro, forte avis quaedam super domus culmen?*” I remember the noise: it was a very remarkable sound, probably in the air.

22d.—A fine discoid Lunar Halo, at half-past 11, P. M.

* 1810. JAN. 6th.—The Heartsease *Viola tricolor* in flower.

10th.—The Primrose in flower here and there.

FEB. 4th.—The Snowdrop in flower. Frogs seen.

10th.—The copulation of Frogs noticed to-day. At night the abundance of Spiders on the walls portends rain.

11th.—To the indications of Rain of last night, were added this morning Waneclouds and other light modifications variously mixed in the Sky: the Rain followed at night.

The Vapour Guage indicated no evaporation.

15th.—Hail fell in the form of small round globes: at night a Lunar Halo predicting a further fall.

16th.—Snow followed the prediction of last night.

17th.—The Marsh Titmouse noticed feeding among Sparrows. Snowdrops in flower plentifully, and the Crocus is beginning to blow.

MARCH 2d.—The yellow, the striped, the white, and the purple varieties of the Crocus plentiful.

4th.—Toads have been seen already.

10th.—Bats first seen this evening. Thermometer at 2, P. M. 58°. Sitting late at night by the fire place with my

father, we noticed the appearance of a large *Scarabaeus* crossing the hearth.

12th.—*Narcissus pseudonarcissus* the early Daffodil in blow.

19th.—I heard the song of the Thrush from a neighbouring garden.

24th.—Two unknown birds, exceeding the Thrush in bigness, flew over the house. *Camellia Japonica* in flower.

29th.—I find the following note in my Latin Journal of to-day:—*Visa vespertilio volitans vespere vero vere veniens.*

APRIL 4th.—Many of the Willows in flower.

18th.—M. Sowerby the minerlogist noticed two Swallows at Carshalton in Surry.

20th.—I saw Swallows and Martins at Plaistow, and heard the Wryneck.

21st.—Swallows frequent the Chimneys at Clapton.

22d.—Cuckoo first heard at Walthamstow.

24th.—The Wryneck *Lynx torquilla* now constantly heard.

30th.—Swallows become partly common.

MAY 6th.—Gyrations of Martins flying high in the air in circles. These birds seem to be very considerably diminished of late years in their numbers about Hackney Church.

19th.—Swift first seen at Upper Clapton. *Papaver orientale* in flower.

25th.—Hackney Old Tower abounds again with Swifts.

30th.—*Papaver cambricum* in flower.

JUNE 1st.—*Tragopogon porrifolius* in flower.

3d.—*Iris lurida*, *I. Germanica*, and others in flower: at night Falling Stars.

28th.—*Papaver orientale* in flower at Walthamstow, where it is always later than at Clapton.

JULY 2d.—The Song Thrush has built a nest in the Egglantine against the house. *Sonchus coeruleus* and numerous Poppies in flower.

17th.—The Sunflower in blow growing out of the garden wall, where it had taken root, probably from some seed dropped by a bird.

29th.—The blue flowered Sow Thistle in flower, which we have hitherto called *Sonchus coeruleus*.

AUG. 12th.—A Swift seen flying about within the Church. Willow Wrens seen.

26th.—I noticed Swifts flying about the towers of Ely Cathedral.

SEP. 2d.—Very hot day, the Thermometer 84° in the shade, and 78° at 3 P. M. under a tree. The clamorousness of the Ducks portends Rain.

5th.—*Stapelia verucosa*, *S. asteria*, and *S. radiata* in flower in the greenhouse of T. F. Forster, Esq. at Clapton.

21st.—*Stapelia variegata*, and *S. bigemina flore luteo* in flower.

24th.—Swallows and Martins congregate, as do also Sparrows. Sunflowers still common.

27th.—The wind has been for a long time S. E. at night, and we distinctly hear the very distant report of some evening cannon at 9 o'clock.

OCT. 2d.—The clouds to-day were all Stackenclouds, the Wanecloud, Sondercloud, and varieties of the Curlcloud, which have so long prevailed, having to-day been missed. Hypochondriacal and bilious complaints very prevalent this autumn.

3d.—*Jasmin Azoreticum* and *Oxalis purpurea* in flower.

10th.—Swallows and Martins seen at Ewell.

16th.—The loud report of a cannon, many miles to the

South East, distinctly heard at 8 and at 9 o'clock at Clapton :
Wind S. E. Starlings seen in numbers.

22d.—*Parus caudatus* seen at Walthamstow.—I passed the remainder of October and the chief part of November at Walthamstow, but was too ill to make any accurate observations, having participated largely in an atrabilious Epidemic that prevailed all the autumn. I learnt afterwards that the season had been marked by very peculiar circumstances of the Atmosphere and its Phaenomena. The Plane Trees in most parts of the Kingdom had died, and the distribution of clouds in the Sky was very peculiar during August and September; and hypochondriacal complaints began to prevail early in October, at the beginning of the rainy weather. It was at this period that the Electric Bells of M. Benjamin M. Forster's Electroscope beat with so remarkable a pulsation, to which I have alluded in my journals.

* 1811. JAN. 11th.—Sea Gulls seen in the marshes. Owls heard in the garden.

FEB. 13th.—Frogs seen already.

24th.—Thrushes and Blackbirds begin to sing. Owls hoot and schreech.

MARCH 4th.—The Croucs in flower at Clapton.

17th.—Frogs croak in the pools. Bat seen.

18th.—Clear weather with Easterly Winds, very multiform Cirri, Falling Stars, &c. marking a peculiarly unwholesome state of the air.

21st.—There are some germinal appearances on the earlier budding trees and shrubs. The Owls hoot very much this spring.

27th.—An early spring and the flowers of the Primavera Flora forward. Daffodils and other early plants in flower.

APRIL 5th.—Tadpoles abundant: I made an experiment to show that they would live and grow to maturity in distilled water. I observed to day, for the first time, the Blackcap *Motacilla atricapilla* at Walthamstow.

17th.—The Wryneck *Iynx torquilla* first heard at Walthamstow.

20th.—The Redstart first noticed at Walthamstow.

21st.—Swallows first seen at Walthamstow, where I also first heard the Cuckoo.

MAY 13th.—*Papaver orientale* has been in full flower at Clapton for some days past. The Redstart has a nest with eggs already in the garden.

27th.—*Scilla Peruviana* in flower. This plant flowers annually about this time, in the small border with a Southern aspect. *Hyocyamus albus* also in flower.

JUNE 5th.—The purple Goatsbeard *T. porrifolius* in flower, as are likewise many Geraniums.

10th.—I observed the *Strix flammea* at Farningham.

16th.—Walking with my sister at Upper Clapton this evening I observed very curious cymoid forms of the Wanecloud, which appeared to be produced by the passage under them of Twainclouds. By moonlight, later at night, a fine bed of Sondercloud prevailed.

17th.—*Papaver somniferum* in flower.

28th.—Being at Eaton near Norwich, I noticed this evening the whole welkin to be replete with beautiful Sonderclouds whose nubeculae were large and distinct.

29th.—I observed a vast quantity of *Fuci* on the beach at Crowmer.

AUG. 10th.—The night was clear after a showery day, returning from Walthamstow with my father, I noticed to him the extraordinary length and white phosphorent appearance

of the trains of light left behind the numerous Falling Stars which we observed. They are common in August.

11th.—Four Herons noticed at Walthamstow.

12th.—M. Sadler ascended in an air balloon from Hackney, and having got into a N. W. Wind, was carried towards the Thames, and descended near Tilbury Fort.

13th.—Apples seem abundant this year, as are also Apricots. Mellons are large but of bad flavour.

29th.—Sadler's balloon descended near Kelvedon, having mounted from Hackney. During this month my brother constructed and sent up a great number of small fire balloons, by observing which I ascertained by various circumstances elsewhere noticed, that the changes of wind begin first in the higher regions of the air.

SEP. 1st.—About four this morning my father entered my chamber, and said he observed something like a Comet in the North. I immediately got a telescope, when we both distinctly ascertained it to be one, and that it was in Asterion. This Comet became a brilliant spectacle during the remainder of the month.

10th.—*Cactus Jamaicensis* flowers in the garden.

OCT. 8th.—Congregations of Swallows and of Martins.

* 1812. JAN. 27th.—A coloured Lunar Halo appeared.

FEB. 6th.—The Slugs begin to crawl. The Thrush sings.

7th.—The Snowdrop in flower at Walthamstow.

16th.—The Crocus in flower. Snowdrops abundant. I heard the vernal sound of Frogs croaking in a pond by the side of the Lea Bridge Road.

22d.—A Thundershower with Hail to-day.

26th.—The proverb of "February fill' dyke" is made good this year. The marshes of the Lea are quite flooded, and all the ditches stream with water.

MARCH 19th.—The European Goldcrest seen in the garden.

26th.—A small balloon sent up this day by my brother was moved first by a current from N. E., then N., and lastly E.

APRIL 12th.—Daffodils, and Primroses, and other plants of the Primaveral Flora already in blow in profusion. But there are no signs of leaves on the trees yet.

16th.—I observed Swallows on the wing to-day.

18th.—I noticed Swallows and Martins flying about the lakes on Wanstead Forest.

23d.—St. George's Day. The Cuckoo first heard.

26th.—The Creeper observed running about the boughs and stems of the Larch Trees.

30th.—The Sparrows again building their yearly nest under the gutter above my window. Swallows begin to be common.

MAY 31st.—The Titmouse has a nest in the Vine at Walthamstow.

JUNE 2d.—The Purple Goatsbeard and the Monkey Poppy have for some days been in flower.

8th.—*Scilla Peruviana* coming into blow.

12th.—*Papaver orientale* in full flower. This plant appears not to be easily propagated by seed.

15th.—*Helonias Asphodiloides* in blow.

JULY 7th.—*Sonchus coeruleus* in blow : plenty of Poppies. Being of late for a week at Anchorwyck near Virginia Water, I omitted regular observations at Clapton.—I was again forced to omit regular observations, in consequence of a Tour to the Coast and to Tunbridge Wells, in August and September.

SEP. 1st.—*Hirundo apus* seen by me at Penshurst.

DEC. 18th.—Wildgeese have this year been numerous in flocks in Cambridgeshire, and frequently pass in aerial flights over the town, making a harsh cry.

* 1813. JUNE 16th.—*Papaver orientale* and *Tragopogon porrifolius* in full flower.

23d.—My regular register was again interrupted by an accident, this morning, by which the extensor tendon of the index was divided.

JULY 2d.—Travelling to Oxford and Southampton, the regular journal was omitted.

* 1814. FEB. 11th.—Sea Gulls *Lari cani* in the marshes.

APRIL 11th.—Wryneck *Iqut torgilla* heard.

19th.—Swallows seen about.

In August I went to North Wales, and this journal was discontinued for a time. In July 1815 I went to France and French Flanders; in August again to North Wales. In February, 1816, to Edinburgh and the Highlands, and in the autumn following to Weymouth and South Wales, consequently the regular series of observations at Clapton could not be recorded; nor were they resumed till we came into residence at Spa Lodge, Tunbridge Wells, in 1817.

* TUNBRIDGE WELLS, 1817. APRIL 10th.—*Hirundo rustica*.

26th. *Hirundo urbica*.

MAY 10th.—*Hirundo apus*.

AUG. 25th.—*Hirundo apus* still seen.

28th.—The last Swift, *H. apus*, seen.

SEP. 12th.—*Motacilla alba* very numerous.

29th.—The least Willow Wren, *Ficedula pinetorum*, seen on Bishop's Down.

OCT. 3d.—A flock of Wandering Tailpyes *Mecisturae vagantes*, seen near Lankington.

6th.—*Motacilla alba* still numerous and already in winter plumage.

16th.—Martins *H. urbicae* seen at Clapton.

19th.—The Creeper *Certhia familiaris* seen on the Pine Trees climbing the stems. The lesser Pettychaps *Ficedula pinctorum* seen on the Larch Trees running and flitting among the boughs, at Walthamstow.

20th.—Swallows *H. rusticae* last seen at Clapton.

NOV. 7th.—The Nuthatch *Sitta Europaea*, and the small Woodpecker *Picus minor*, observed at Bushy Heath. The Chaffinches very numerous, but almost all that I observed were small birds.

DEC. 7th.—I observed two birds in the garden at Walthamstow which from their appearance I judge to be Grosbeaks *Loxia coccothraustes*.

* 1818. APRIL 16th.—The Wryneck, the Redstart, and the Blackcap, seen at Walthamstow.

17th.—The Swallow *Hirundo rustica* first seen at Woodford.

20th.—A great number of Narcissuses in flower at Walthamstow, which I purchased from the collection of the late M. Anderson.

29th.—The Martlett *Hirundo urbica* first appears. Swallows become numerous. Willow Wrens are already arrived.

MAY 1st.—Bats, which are numerous in spring and in autumn, begin already to be less frequent.

3d.—Tulips abundantly in flower at Clapton. The Cuckoo daily heard. Owls very noisy by night.

11th.—This day we came into residence at HARTWELL, near EAST GRINSTEAD, so that the observations herein subsequently recorded relate to this neighbourhood, unless otherwise specified.

12th.—The Waterhen *Fulica chloropus* has a nest in the pond.

16th.—Swallows flying low portend rain to-day.

30th.—The Nightingale *Sylvia Luscinia* still continues to

sing all night on the trees near the house. An electrical change in the air to-day produced headache and nervous complaints in many persons here. Swifts not common yet.

JUNE 2d.—The Blue Dragonfly *Libellula puella* first seen about the pond to-day. The following birds have now nests in the particular places subjoined:—

Muscicapa grisola, under the cover of the porch among the Woodbines.

Fringilla carduelis in the Apple Tree.

Fringilla coelebs in the same.

Passer domesticus in the roof of the house.

Hirundo rustica in the chimneys.

Sturnus vulgaris in the trees numerouslly.

4th.—*Iris Germanica alba var.* in flower.

9th.—The weather begins to be very hot, the thermometer*

74.°—the whole remainder of the summer continued hot, the thermometer being generally about 80.° of Farenheit's scale.

JULY 15th.—*Ficedula sylvicola* the Wood Wren seen and become common.

21st.—*Falco tinnunculus* has fledged young ones, two of which I brought up from the nest and liberated.

25th.—*Cyprinus phoxinus* caught in the stream.

Alcedo ispida the Kingfisher or Halcyon seen about the great pond.

27th.—The following fishes were to-day caught in the river:—

Cyprinus gobio the Gudgeon.

Cyprinus rutilus the Roach.

Cyprinus alburnus the Bleak.

Cyprinus phoxinus the Minnow—a sprinkling of rain

* Farenheit's scale is used.

made the fish bite very fast all the morning. Carp and Tench abundant in the ponds.

28th.—*Strix flammea* observed in the evening soaring about the meadows and under the hedges in search of food.

31st.—Four species of *Libellula* seen about the ponds.

AUG. 1st.—A small fish is caught by my brother and myself, in the streams about the bridges which seems to be the Bleak. We caught in the same place the Roach, the Dace, the Pearch, the Gudgeon, and the Chub.

2d.—Immense flocks of clamourous Starlings flying about the fields and lodging now and then on the trees.

14th.—The Swifts seem to have taken their departure. Falling Stars prevail much about this time of year, particularly with East winds.

20th.—Swallows fly near the ground, indicating rain.

Conops cursitans, that detestable Horsefly is particularly troublesome this year.

22d.—Sailing off Brighton with my brother, I noticed the quantity and diversity of Sea Gulls which inhabit this Coast. The Red Gurnet already in the markets. They say the Red Surmullet is also found here later in the year.

26th.—A Specimen of *Cyprinus gobio* the Gudgeon caught, which was as large as a Carp.

SEP. 2d.—*Limicula glottis* the Green Shank at Southampton.

7th.—The Grey Mullet common at Dawlish.

13th.—I noticed the Guillemot *Uria troile* while rowing in the Bay at Ilfra Combe, in Devonshire.

OCT. 12th.—*Agaricus varians*, *A. campestris*, *A. fascicularis*, and other Fungi and Mushrooms abundant. Abundance of Apples this year.

18th.—M. Benjamin M. Forster and I gathered to-day the following Fungi and Mushrooms in abundance:—

Agaricus denticulatus.

A. campestris, common Mushroom.

A. fascicularis.

A. floccosus, under the Apple Tree.

A. glutinosus, in the grass.

A. polygramus.

A. stercorarius, in long grass and dung.

A. verucosus.

A. integer, crimson, pale, and slate colour.

A. muscarius, of both colours.

A. procerus, the tall Agarick.

A. plicatilis, in the grass.

A. elephantinus, very large indeed.

A. cumulatus.

A. congregatus.

A. violaceus, a beautiful species.

A. denticulatus, and many others.

Boletus bovinus, very large, some were one foot high.

B. edutis.

B. igniarcus.

Calvaria hypoxolon.

C. muscoides.

Helvelia sarcoides.

Peziza coccinea.

This is one of the most luxuriant seasons for all the above tribe of plants that I ever remember.*

25th.—Hydrophobia said to prevail much among Dogs.

NOV. 4th.—Flocks of Wild Geese.

* See my Letter in Phil. Mag.

* 1819. MARCH 16th.—Cloudy morning; fair afternoon. The thermometer 60°.

Tussilago farfara in flower beside Lea river. Daisies also bloomed. I found the *Peziza scutellata* var. (of Sowerby, Feb. 24th,) on cow dung to-day in the marshes.

Tussilago petasitis in bloom in the garden.

18th—*Bellis perennis* every where in flower; and the *Ficaria verna*, or Pilewort, here and there.

19th.—The first day of spring showers, the Wind changing at 10 A. M. from S.W. to N.W., and blowing a gale at times, with Rain and Hail in showers. Grape Hyacinth and the Blue Hepatica in flower.

23d.—*Stellaria media* in flower. The Rooks and Daws building their nests.

24th.—This was a fine spring day, with West Wind and mild air. The cumulus cloud as usual prevailed, but there was a fine display of cirrus and cirrostratus in mottled rows up in a higher region.

Leontodon taraxacum in flower. The Willows are in catkin every where; and the leaves of the Eglantine budding. The birds sung till past seven in the evening, when the *Scarabaeus fimetarius* was on the wing.

25th.—Fine warm day, with Westerly Wind and cirrus clouds. We had a smart Thundershower, with Hail, at about noon; and slight showers followed. The Larch Trees are budding, and the Elms in full flower.

Fumaria tuberosa in bloom.

Viola odorata also in flower.

26th.—*Carabus hortensis* first appeared to-day. The Horse Chesnut trees began to put forth leaves.

Anemone hortensis, *Calendula officinalis*, the Marigold, and several other early plants in flower in the garden.

27th.—Strong Wind from W. and troublesome dust ushered in Rain.

28th.—Fine small Rain and warm air; vegetation begins to advance rapidly.

29th.—*Veronica arvensis** in blow on a wall at Woodford. Several kinds of *Narcissi (exotici)* came into flower in the garden. The *Tremella deliquescens* (of some authors) is still abundant on the sear wood of an old paling.

30th.—*Cardamine hirsuta* in flower to-day. Some of our vernal songsters are already arrived, and fill the groves with their music.

31st.—The Cowslip *Primula veris* came into flower, the Dead Nettle *Lamium purpureum*, the *Veronica agrestis*, and *Veronica hederifolia*. Clouded, warm, still day. S.W. Wind, and thermometer barely reached 60° of Farenheit. Pilewort is now plentiful in the meadows. I have not yet seen the Marsh Marigold; but as this plant flowered by unseasonable anticipation in December last, it may not, perhaps, have flowered a second time yet.

APRIL 1.—Fine warm weather, Wind W.S.W., and thermometer 62°. The Garden Spiders and the Earwig first seen. The Wallflower in bloom, and also *Lamium amplexicaule* on the walls. The Bees begin to abound.

2d.—*Caltha palustris* at length coming into flower: fine warm weather.

3d.—The temperature above 60°, with a clear welkin, and red sunset. I first noticed to-day the Least Willow Wren *Sylvia hippolais*, and the Blackcap *Curruca atricapilla*. The

* Botanists should avoid confounding this *Veronica* with the *V. agrestis*, which it much resembles; the latter grows generally on the ground; the former generally on walls, in company often with the *Draba verna*.

Bat was flying about in the evening. The yellow and brown Butterflies first appeared; and the Auricula, Hyacinth, and *Narcissi odori* in blow.

4th.—*Phoenicurus ruficilla* the Redstart first appeared
Anchusa sempervirens in bloom in the garden.*

6th.—Cold East Wind; but fine day.

7th.—*Anemone nemorosa*, *Erisemum barbarea*, and *Oxalis Acetosa* in flower on Hainault Forest. The Pettychaps became frequent on the Larch and Pine Trees in the garden. Various species of *Staphilynus* come forth.

8th.—Rainy day. The lesser Pettychaps already frequent the Larches.

9th.—The female Redstart seen.

10th.—*Jynx torquilla* heard at Walthamstow.

11th.—*Cuculus canorus* the Cuckoo at North Mims. Plants in flower, *Populus nigra*, *Primula elatior*, *Ribes alpina*, *Vince major*, and *V. minor*. *Scilla nutans* and *S. italicus* in the garden. *Luzula pilosus*, *L. forsteri*, and *L. campestris*. *Pulmonaria officinalis*, and *P. longifolia*, *Narcissus poeticus*, *N. pseudonarcissus*, *N. major*, *N. odorus*, *N. incomparabilis*, *N. tenuis*, and *N. Italicus*, in open ground in the garden, *Caltha radicans*, *Ranunculus aquatilis*, *Lamium Garganicum*, and *Anemone ranunculoides*.

Vegetation rapidly advances; the fields begin to be spangled every where with Pilewort, Daisies, and Dandelions. A few instances are still afforded of the production of unseasonable phaenomena, with which these last two years have abounded;

* The flowers of *Veronica chamaedris*, when growing wild, are of a lively blue colour, and so like those of *Anchusa sompervirens*, that only the slightest shade of difference can in general be found by comparison; there is a slight dash of green in one of them. The *Cynoglossum omphalodes* and the *Borago officinalis* afford examples of the finest and purest blue.

among others the *Bundfungus Agaricus fascicularis* is growing abundantly at Upton, in Essex.

M. Thomas F. Forster, of Clapton, discovered, at North Mims, on the 11th, a variety of the *Primula vulgaris*, with bright saffron coloured yellow flowers.

The Calendar of Flora Fauna and Pomona is from this time henceforward kept at Hartwell, by Tunbridge Wells, Sussex.

APRIL 15th.—*Hirundo rustica* the Swallow first made its appearance in the neighbourhood of Lingfield. The Turnip is now in full flower every where. *Fulica chloropus* the Moorhen is building. The seeds of *Papaver somniferum* coming up, which were sown only a week ago. Vipers and Snakes out a considerable time.

17th—Cool showery weather, and Westerly Wind. The Cowslip and Pagel* every where in flower hereabouts. Pilewort still flowering abundantly, and *Cardamine pratensis* in all the meadows.

18th.—*Orchis mascula* in flower under a hedge facing the South. The Kidlock *Sinapis arvensis* plentifully in flower in the corn fields near Cowden and elsewhere. Specimens appear here and there in marshy ground of the *Agaricus glutinosus*.

19th.—A thorough rainy day. A few Swallows were flying about at Hartfield. I had not seen this bird before

* The word Pagel for the *Primula veris* is evidently a corruption of Pratigale; we have several such terminations, as Nightingale, &c.

since the 15th, and they are not common yet. *Allium ursinum* in flower.

20th.—Rainy morning. Stitchwort *Stellaria holostea* in flower under the hedges between Hartfield and Withyham.

21st.—Showery; but fair evening. *Tussilago farfara* in seed at Lankington Green.

22d.—Wind got to Northward, and cooler.

23d.—Rain in gentle showers, and cool. *Ranunculus bulbosus* came into flower. Swallows as yet but few. *Mercurialis perennis* in blow.

24th.—Rainy cold day. From a Correspondent I learn that *Thlapsi bursa pastoris*, *Fritillaria meleagris*, *Draba muralis*, and the great Leopard's Bane *Doronicum pardalianches* are in bloom at Walthamstow.

25th.—The Wryneck first heard at Hartwell; cold day. The House Martin *Hirundo urbica* seen. Swallows become more frequent. *Agaricus glutinosus* still found in the fields; but the pileus of it is lighter coloured than that of the same plant in autumn. The *Tremella mesenterica* growing on some sear trunks.

27th.—Clear cold day; Wind Easterly. *Lycoperdon epidendrum* found flourishing.

Sylvia luscinia the Nightingale first heard singing, notwithstanding the coldness of the night.

28th.—*Ranunculus acris* in flower here and there.

30th.—*Ranunculus arvensis* in bloom.

MAY 2d.—Warmer weather to-day, and a fine shower at night; the cirri and Waneclouds, which appeared all day and yesterday, were a sure indication of a change. *Sinapis arvensis* the Kidlock is still abundantly in flower every where.*

* This plant *Sinapis arvensis* should be carefully distinguished from the other, called Charlock, viz. *Raphanus raphanistrum*, which much

3d.—The *Cynoglossum omphalodes*, so remarkable for its brilliant blue colour, still in bloom.*

5th.—A fine warm spring day, alter a night of rain. *Schoeniclus arundinaceus* observed. Swallows and Martlets become common. *Orchis morio* in flower.

6th.—The following plants now in full flower:—*Ranunculus bulbosus*, *R. acris*, *Fragaria sterilis*, *Erysimum alliaria*, *Veronica chamaedris*, *V. serpyllifolia*, *V. agrestis*, *V. arvensis*, and *V. hederifolia*, *Anthoxanthum odoratum*. *Valeriana dioica*, and *V. locusta*, *Phleum pratense*. *Alopecurus pratensis*, *Briza major*, *Poa annua*, *P. trivialis*, and *P. pratensis*. *Galium cruciatum*, *Alchemilla arvensis*, *Sagina erecta*, *Myosotis arvensis*, *M. versicolor*, and *M. umbrata*. *Borago officinalis*, *Primula elatior*, and *P. veris*. *Anagallis arvensis*, *Viola tricolor*, and *V. tonbrigensis* (supposed a variety), *Sanicula Europaea*, *Caucalis anthriscus*, *Scandix pecten veneris*, *Viburnum lantana*, *Narcissus biflorus*, *Allium ursinum*, *Scilla campanulata*, *Vaccinium myrtillus*, *Acer pseudoplatanus*, and *A. campestre*. *Chrysosplenium alternifolium* (wild), *Arenaria trinervia*, *Lychnis dioica purpurea* and *L. dioica alba*, *Cerastium vulgatum*, *Euphorbia amygdaloides*, *Mespilus*

resembles it; but which in this district is not near so common. The former is a troublesome weed in corn; and its seeds, when deeply buried by ploughing, work their way by degrees up to the surface, and grow again. This circumstance, which is common to many plants, leads us to inquire by what means seeds possess this ascending power, when buried, of regaining the surface of the earth?

* There are three plants in our gardens noted for the brilliancy of their light blue flowers. The *Cynoglossum* is the purest fine ultramarine colour; the *Veronica chamaedrys* has a very slight tint of the red in its composition; and the *Anchusa sempervirens* (the third I allude to) has a tint of greenish. The blue of the *Cynoglossum* being the only perfect blue.

oxyacantha, *Pyrus malus*, and *P. aria*. *Adonis autumnalis* (in T. F. Forster's garden), *Ranunculus auricomus* in the corn fields.

12th.—*Raphanus raphanistrum* the Charlock; also *Sinapis nigra*. The *S. arvensis* still abounds.

The weather continues warm and still, and the foliage advances. There is every appearance of spring. The banks are covered with *Viola canina*, and the fields here gilded with *Ranunculi*, there blue with *Scilla nutans*.

13th.—*Iris Germanica* in flower in the garden.

14th.—*Hieracium pilosella* in flower on a warm bank near Lankington Green.

16th.—A single specimen of *Papaver argemone* found flowering near Epsom. Also in full flower,—*Geranium Robertianum*, *G. molle*, *G. rotundifolium*, *G. pusillum*, *Fumaria tenuifolia*, *F. officinalis*, *Genista anglica*, *Erodium cicutarium*, *Campanula hybrida*, *Scandix anthriscus*, *Viburnum lantana*, *Alopecurus pratensis*, and *Matricaria chamomilla*. The fields are now spangled with *Ranunculus*, and in some the luxuriance of *Scilla nutans*, makes the ground a beautiful blue colour.

17th.—*Hypochaeris radicata* came into flower on a dry bank by an orchard.

Hirundo riparia the Sand Martin flying about the holes in the sand near Withyham.

18th.—*Ranunculus repens* in flower every where. In the same meadow with this plant *R. bulbosus* and *R. acris* are abundant. *R. auricomus* and *R. arvensis* in the next field. *Narcissus poeticus* still in flower in the garden.

21st.—*Hirundo apus* the Swift to-day. They are said to have been seen for some time past. *Fringilla coelebs* has a fledged brood.

Papaver Cambricum in full flower in a garden at Withyham. The *Dentaria bulbifera* at the high rocks is gone out of flower; it was in full bloom April 22d. That beautiful plant the *Gentiana acaulis* flowered in the garden, and is now gone out.

22d.—Fine growing day after several of rain. Vegetation advances rapidly. *Rhododendron Ponticum* coming into flower; also Columbine, and many other garden flowers. The Monk's Hood Poppy *Papaver orientale* is just opening. I noticed the Mayweed *Chrysanthemum leucanthemum* in blow in the meadows. The Chub *Cyprinus jesus* caught in the stream which runs into the Medway. I have not yet seen the Pearch, Bleak, and Roach taken, which also abound in the same stream. The cottage gardens are now ornamented with Tulips, Marigolds, and Stocks.

24th.—NATALIS LINNAEI.—*Papaver orientale* the Monk's Hood Poppy in flower in several gardens; also here and there a wild specimen of *P. Argemone*.

25th.—*Tragopogon porrifolius* the Goat's Beard in flower in T. F. Forster's garden at Clapton; also *Scylla peruviana*.

26th.—Abundance of flexuous and angular cirrus cloud in the lighter intervals of a cool cloudy day, with N. E. Wind. *Tragopogon porrifolius* the Purple Goatbeard *Τραγοπωγών* came into flower in my garden this morning.

30th.—We have now come into flower, *Myosotus scorpioides*, *Erisenum officinale*, *Apargia hispida*, and *Cardamine amara*; and *Hypochaeris glabra* is coming out. In the hollow field I found the *Agaricus verucosus*. Columbines in full blow.

JUNE 3d.—The first Strawberry gathered to-day. *Digitalis purpurea* the Foxglove in flower. Thistles begin to bloom. *Carduus pratensis* is already out. The weather is warmer than it was last week, but by no means seasonable. *Fringilla*

carduelis the Goldfinch has young ones almost fledged. I noticed to-day the exactness with which the purple Goat's Beard, closed its blossoms at noon.*

5th.—The gardens now begin to be ornamented with Pinks, Roses, and other early summer flowers.

Iris pseudacorus the Flag is still out in abundance by the sides of ponds and rivers. The Monkey Poppy, the German Iris, and Goat's Beard, with many others, are still in prime. The weather is moderately warm, with abundance of Cirrus clouds; afterwards a fine summer's evening, and stratus.

Ornithogalum umbellatum was flowering wild near Bleaching to-day. This is a very rare plant hereabouts.

6th.—A return of fine warm spring weather, with S. W. Wind. In riding through the corn fields this morning, I was struck with the total absence of Corn Poppies *Papaver Rhæas*, and *P. dubium*. The former of these is a plentiful weed in Surrey, and in all the chalky soils also about London; but in this clay district it is a plant of extremely rare occurrence.

The yellow Jasmin is flowering in the garden. The four sorts of Ranunculi and the *Potentilla reptans* are still abundantly in flower in fields and hedges. Thermometer at 4 p. m. 62°; barometer falling, and 29° 95'. I found the Marsh Groundsel *Senecio aquaticus* flowering among the long grass in the meadows this evening. The Oxeye or Midsummer Daisy is now abundantly in flower.

8th.—*Sonchus oleraceus* the Sowthistle and lesser Stitchwort in flower.

* This property of many flowers, particularly of syngenesious plants, of closing at particular hours, ought to be more minutely attended to. The two British Goat's Beards *T. porrifolius* and *T. pratensis* shut up at noon. The Cat's Ear *Hypochaeris radicata* closes at three o'clock, and the *Hieracium pilosella* at three quarters past two.

10th.—The temperature remains steady; thermometer about 62° , barometer rising to $30^{\circ} 10'$. Fair weather, with occasional showers. The gardens begin to look very gay with flowers. Besides Pinks, Sweetwilliams, and various exotics, many of the solstitial flowers are opening; the garden Poppies will be out in a few days, Meanwhile the Vernal Flora has not yet subsided. Buttercups and Daisies still adorn the meadows. The POMONA also advances. Not only the scarlet Strawberry, but the Chili and the pine wood Strawberry were gathered abundantly in some gardens last and this week.

11th.—The wild Mallow is now in flower.

13th.—Arriving at Limpsfield to-day, I found *Papaver Rhæas* flowering among the corn, though not a specimen is to be found about Hartfield. *P. argemone* was in seedpod, and already deflowered. The reason why the corn Poppies do not flourish about Hartfield, is probably the sort of soil. In the chalk countries within a few miles they are common weeds.

At Walthamstow to-day I found *Papaver somniferum* in flower in the gardens, both the large white Poppy and the garden or variegated species. In the ponds and rivers the Yellow Water Lily *Nymphaea lutea* is in blow.

14th.—*Gladiolus communis* the Corn Flag in flower. Returning home from London to-day, I observed the Red Poppy *Papaver Rhæas* flowering among the corn and by the road sides, all the way as far as Limpsfield: but here we enter a different soil, and they are no longer common weeds.

The following plants of the VERNAL FLORA still remain in blow:—*Ranunculus acris*, *R. auricomus*, *R. bulbosus*, *R. hirsutus*, *R. pratensis*. The meadows are still spangled with them, and also here and there ornamented with *Lychnis dioica*, *Chrysanthemum Leucanthemum*, Shepherd's Purse, Daisies, &c. Marigolds and other spring flowers are still

seen in gardens. The Poppies belong more properly to the SOLSTITIAL FLORA. The *P. somniferum* is coming into flower in several gardens about London. *P. hortorum** is likewise in flower, and *P. orientale* and *P. cambricum* have not yet gone out. Wild as well as garden Roses are very luxuriant: of the former, *Rosa canina* and *R. rubiginosa* are very abundant. Cinquefoil *Potentilla reptans*, and also *Tormentilla reptans* in flower.

Tragopogon pratensis and *T. porrifolius* are now in full flower.

† 16th.—Travelling into Hampshire, I again noticed the abundance of *Papaver rhæas* as soon as I got into the chalky soil. *P. dubium* likewise was flowering here and there.‡ *P.*

* I have adopted this name for the Variegated Garden Poppy till its species shall be determined. I am doubtful whether it should be regarded as a variety of the White Poppy *P. somniferum*, the capsule being only one fourth of the size, while the whole plant and flowers are larger, the leaves being paler and less jagged, and by its wanting the hispidity of the stalk beneath the flower. Moreover, I do not know of any proof that the seeds of the White Poppy come up and bear the flower of the variegated kind in any soil whatever. The origin of species generally may be reckoned very doubtful. Species may be only varieties become permanent in their character by time. But certainly the Variegated Poppy has as just a claim to distinction from the white as many plants admittedly different in species. The effect produced by soil, and the varieties in the composition of the characteristics in different specimens, may be regarded as constituting the strongest arguments on the other side of the question, and as corroborating the notion of the garden Poppy being only a variety.

† PRAGUE, AUG. 11.—The 26th ult. one of the towers of the Cathedral was struck by Lightning and entirely destroyed; the roofs of the adjoining houses were much damaged by the fall from it of masses of stones and masonry.

‡ *P. hortorum* is the name by which I sometimes distinguish the garden variety from the large White or Official Poppy.

hortorum is now common in the gardens; as are Auriculas, Sweetwilliams, Marigolds, Garden Mallows, and other summer flowers.

20th.—Fine warm weather has at length succeeded the cool. The hay is down, and in some places stacked. The Yellow Lily is in full flower; as are likewise the Pike Geranium, the White and also the Blue Flaxinella, and numerous Roses. The Peony is already casting its petals to decay. A variety of *Centaurea cyanus*, almost white, is common here.

Malva sylvestris in flower. The Stone Curlew heard by night. The Charlock, or Yellow Cornweed, of Hampshire, seems to be all *Sinapis arvensis*. In some places the fields are quite yellow with it; in others the Corn Poppy gives them the distant look of a scarlet sheet thrown over the meadows.

Verbascum Thapsus coming into bloom.

23d.—I gathered the seeds of *Tragopogon pratensis* near Odiham. *Crepis tectorum* abundant.

24th.—Showery weather again, and a clouded Sky, which retards the progress of the SOLSTITIAL FLORA. The Pike Geranium *G. sanguineum* in full blow.

26th.—*Lychnis Chalcedonica* the Scarlet Lightning in flower. The Canterbury Bells *Campanula Medium* in full blow in the garden. The Poppies in my garden are late this year; being sown in spring, instead of last autumn.

27th.—*Carduus palustris C. arvensis* and *C. acanthoides*, in flower. *Papaver hortorum* flowering against the wall of the porch. I noticed this evening, among the high wheat, abundance of the Corn Chamomile *Anthemis cotula* in flower.

28th.—Showery weather, and a great deal of hay beat down. I found this morning, among an abundance of the

Pimpernel *Anagallis arvensis*, the several specimens of the permanent white variety. The blue variety is not frequent here.

About half past eleven to-day there fell a violent shower of Hail, with Thunder and Lightning. The Hailstones were the largest I ever saw: some I measured exceeded half an inch in diameter.

Hieracium murorum and the *Cnicus pratensis* in flower in the hollow field, and *Myosotis palustris* by the side of the rivulets.

29th.—*Centaurea nigra* Knapweed in flower; also *Centaurea cyanus* Cornflower.

JULY 1st.—*Agrimonia Eupatoria* in flower on a bank between Groombridge and Withyham. The grass in this neighbourhood is for the most part standing yet. That which is already cut is somewhat damaged by the wet.

2d.—*Hypericum perforatum* St. John's Wort in flower on a bank between Hartfield and Withyham. *Lapsana communis* abundantly in blow.

3d.—Warm cloudy day, ushered in by misty Rain. Thermometer at maximum 70°, Barometer 29' 82', Wind S. W. The evening became very warm and fair. *Cyprinus rutilus* Roach taken in the river.

About eleven P. M. I accidentally discovered a brilliant COMET in the North. The nucleus of it seemed brighter and the tail longer than that of the Comet which appeared in 1811.

4th.—Hot morning. Thermometer 80°, Barometer fell, and it thundered P. M. The Copper Day Lily *Hemerocallis fulva* in full blow.

5th.—*Papaver somniferum* flowered in the Poppy field, sown in March. The Scarlet *Lychnis* makes a splendid figure in the gardens at present.

6th.—*Lilium candidum* the White Lily, and the Orange Lily *Lilium bulbiferum* in blow. Also the large Day Lily.

7th.—*Campanula hederacea*, *C. Trachelium*, and *C. glomerata*, in blow. Also *Convolvulus arvensis*, and *C. sepium*.

8th.—*Cnicus acaulis* in flower near Limpsfield on a chalk hill.

10th.—*Hieracium sylvaticum*, *H. murorum*, *H. prenanthoides*, *H. sabaudum*, and *H. umbellatum*, in flower at Hale End. Likewise *Verbascum Thapsus*, *Carduis marianus*, and *C. acanthoides*.

Returning from town to-day, I again noticed the Red Poppy to be common all the way as far as Limpsfield, in Surrey, where they were last seen. The *Sonchus arvensis* was flowering near Cowden; and the Feverfew *Pyretrum Parthenium* by Eden Bridge.

11th.—A field of White Poppies *Papaver somniferum*, sown in March, is now in full bloom. *Campanula Medium* is in flower, apparently wild, near Hartfield; though perhaps its seeds had escaped from some garden.

12th.—*Agapanthus umbellatus* in blow in T. F. Forster's garden. Fair, warm, still clouded weather. *Oenothera biennis* or Evening Primrose in full flower. A field of White Poppies *Papaver somniferum* in bloom.* The following plants still

* Since I wrote the last note on the varieties of the Poppy, a curious circumstance has occurred.—I sowed some seeds of *Papaver somniferum* in a field of ordinary soil: they came up and bloomed with the plain white flower, and single petals. Some of the same seed, scattered in the rich soil of a garden, came up, and bore variegated flowers, some of which were double, some single, some red or purple, and a few white. The seed of all was from the same capsules, and was the white variety. From this (though there be contradictory evidence on the other side,) I should certainly infer, not only that the Garden Poppy was a mere variety, but that difference of soil has the power very rapidly of producing it.

ornament the gardens with their flowers:—*Lychnis Chalcedonica*, *Lillium candidum*, and *L. bulbiferum*, *Hemerocallis fulva*, *Campanula Medium*, *Rosa centifolia*, *R. canina*, *R. arvensis*, numerous *Geraniums*, *Pinks*, and various sorts of *Dianthus barbatus* called Sweetwilliams. In the fields the *Agrimonia Eupatoria* now abounds.

Sedum acre flourishes on the walls.

By a survey of a great number of Poppies sown for the purpose of comparison, I have in these determined the Official and Garden Poppy to be only varieties. I have always been of opinion, that species originate in hybrid productions in *lusus*, and in permanent varieties, whose characteristics are consolidated by time, and often fixed by soil. Another remarkable instance of the effects of soil occurred to me. I had sown a quantity of Official Poppy seed in a field, and some of the same in a rich garden soil. The former came up White Official Poppies, while the latter were varied, and had black seeds. What is more curious in proportion is, that as the colour of the petals became red, the capsule turned out smaller; and I have intermediate varieties, between the White Official and the Variegated Garden Poppy, whose petals were pale purple, the capsules of a middling size, between the two, and the seed not black, but brownish. Instances, however, occurred of Purple Poppies with large capsules. Another remarkable thing I have observed about these plants is, that when I sowed seed in the garden in clumps, all the Poppies composing certain clumps came up and flowered with the petals of one particular colour, while other clumps were of another colour. Likewise in scattered seed, Poppies immediately in vicinity of each other came up of similar colours. To what this apparent sympathy of contiguity may be owing, I am ignorant; but were it more known, it might throw some light on the true principle of variation and the production of duplicity in flowers.

In one cluster of Poppies, and in one only, they all came up double dentated and white; in another double dentated or fringed and red; in another purple; in a fourth single red; and in a fifth single purple. There were only a few exceptions in individuals to this apparent rule of the uniformity of colour in neighbouring Poppies. I have noticed similar phaenomena in Hollyhocks.

13th.—Fair, but clouded and warm. The Chub *Cyprinus* *Jeses*, the Roach *C. rutilus*, the Bleak *C. alburnus*, and the Pearch *Perca fluviatilis*, caught in the stream between Hartfield and Summer Ford.

14th.—Fair and bright day. *Antirrhenum* *Linaria* in flower. The Gudgeon *Cyprinus* *gobio* caught in the stream. *Malva moschata* out.

15th.—St. Swithin's Day produced only a few drops of Rain. *Lythrum salicaria* abundantly in flower along the banks of the rivers.

16th.—The POMONA is rather backward. Red, White, and Black Currants just ripe. The Scarlet Strawberry still abundant in shady places, though the Chili, the Alpine, and the Hautboy, which came in later, are already going out. The Wood Strawberry still flourishes. Abundance of Minnows caught in the streams. The yellow Hawkseye *Crepis barbata* flowering on a bed of dung, though only sown in the middle of May. Also *Lavatera trimestris*.

17th *Anthemis inodorus*, *A. arvensis*, *A. cotula*, *Matricaria chamomilla*, *Pyrethrum parthenium*, and *Gentiana centaurea* now common.

18th.—Hollyhocks, both white and red varieties, in flower in many gardens hereabouts.

22d.—A white variety of *Digitalis purpurea* in flower at Walthamstow. Sun Flowers in bloom. A variety of *Carduus Marianus* without the milk in seed at Clapton. In the garden of M. Loddidges, at Hackney, I noticed a vast display of *Dalias* *Dahlia superflua* in full flower, and all of different hues.

27th.—Fair warm weather. The Hollyhocks *Althaea rosea* in great profusion now adorn the gardens all the way through Surrey and Kent, from London to Hartfield. In the

Southern parts of Sussex also they are much cultivated. *Cnicus lanceolatus*, *Cnicus arvensis*, and *C. palustris* in full blow every where.

30th.—Weather hot and dry, with S. and E. Winds. Thermometer in the shade 76°. To-day M. Thomas F. Forster found *Buxbaumia foliosa* at Harrison's Rocks. The plant suspected to be *Drosera Anglica*, growing near Forest Row, turns out to be *Drosera longifolia*.

31st.—Very hot day. *Papaver rhæas* (sown only in June) now in full flower in my garden. *P. somniferum* still flowers here and there. The generality of them are in capsule.

Inula dysenterica is now abundantly in flower near Cowden, and elsewhere.

Hieracium sabaudum also in bloom.

AUG. 1st.—*Apargia autumnalis* in blow to-day. I found *Epilobium roseum* and *E. palustre* by the river side. *E. hirsutum* and *E. tetragonum* are also in flower.

2d.—*Linum angustifolium* in blow by the side of the lane at Perry Hill, where it grows of a great size. Apricots and Plums begin to be common.

3d.—The misty mornings begin to indicate autumn. The Mouse Ear Hawkweed *H. Pilosella* in blow a second time. This plant has generally a second flowering in autumn, after having previously gone out of flower.

The *Sedum Forsterianum* still in blow. This plant has accidentally been omitted in Withering's Bot. Arrang. It was found first by M. Edward Forster, at Pont y Mynach, called the Devil's Bridge, in Wales, in 1805.

We discovered to-day, on a bank near Forest Row, an apparently new species of *Hieracium*. It grew close by *H. sabaudum* and *H. umbellatum*; but though it resembled

the latter, did not resemble the former enough to be regarded a hybrid production. M. Edward Forster has had specimens of the same from different parts of England and Wales.*

4th.—*Campanula Medium* still in blow. (This word was erroneously printed *media* in the Journal of last Month.) The weather continues warm; and though obscured by much cloud and mist, the Rain keeps off, and the Barometer rises again.

5th.—The quantity of Cirrus and cirrocumulative Cirrostratus indicates Rain to-day, as does the fading of flowers and the falling of newly planted plants.

6th.—Some Fungi began to appear. *Agaricus integer*, *A. campestris*, var. β ., and *Boletus edulis* found here and there in moist places. *Malaxis paludosa* in flower on Ashburn Forest.†

7th.—*Lysimachia vulgaris* near Summer Ford in flower. The weather warm and dry, but the nights begin to be cooler, with much dew. An unusual degree of haziness has, however, been observed in the air of late, which some persons have ascribed to an eruption of Vesuvius. Summer Pears gathered.

8th.—The weather still dry. *Antirrhenum Linaria* now common in every hedge.

12th.—The Chinese Starwort *Aster Chinensis* in blow in the gardens. *Aster Tradescanti* the Michaelmas Daisy

* This plant turns out to be only a Sussex variety of *Hieracium Sylvaticum*. I have since increased it by seed, so that I observe it yearly in my garden—1823.

† The *Malaxis paludosa* has not been found in this neighbourhood before, since the time of Ray. It is certainly one of our scarcest plants.

sparingly in flower, and what is curious, this has come out on a recently transplanted specimen.

The weather continues hot and dry, with an unusually great quantity of cloudiness and mist in the morning. The soil here is chiefly clay and marle, with some yellow sand. The timber is principally Oak, chiefly the *Quercus Robur*, though we have some *Q. Tessiliflora*. There are some Ashes *Fraxinus elatior*, Beech, and Hornbeam; but scarcely an Elm for many miles round. Our soil does not suit them. The Spanish Chesnut grows here very luxuriantly.

15th.—The weather continues very hot and dry, but the atmosphere is unusually hazy, and there is a greater proportion of cloud than usually happens with hot weather in August. The Thermometer averages as high as 75° at its maximum; to-day it is 78° in the shade; the Barometer rising at 30.10. Wind calm and Southerly.

A few instances of *Papaver Rhæas* occur now near Withyham; but this is a scarce plant here, and for many miles round. *P. somniferum* continues to flower from seeds sown late.

16th.—*Amaranthus hypochondriacus* the Prince's Feather in blow. The weather continues hot, and the mornings clouded, with misty horizon. Barometer rising. *Solidago virgaurea* now abundantly in blow.

21st.—*Papaver hybridum* in flower at East Bourne, where I also observed the wild Cabbage.

25th.—*Hirundo apus* a Swift still seen, though it was probably only a straggler, left behind after the annual emigration, which took place, with the majority of these birds, about ten days ago.

27th.—The weather is become more cloudy, and the Barometer falls: but it is as yet very dry, and few Fungi

have appeared. The POMONA bids very fair. Peaches and Nectarines are in great abundance. Apricots are going out. Pears are more abundant than last year, but Apples are fewer.

30th.—Wind got to S. S. W., and falling Barometer, with the rapid formation of the lighter sorts of cloud over the cumuli. Rain is evidently approaching.

The fields now begin to abound with *Apargia autumnalis*,* *Apargia hispida*, *Trinchia hirta*,† *Hypochaeris radicata*, *H. glabra*, and here and there *Leontodon taraxicum*, still flower. *Crepis barbata* is still abundant in the gardens. *Scabiosa succisa* now common. The Garden Artichoke *Cynara scolymus* in full blow.

31st.—Barometer rising again, with cool Wind. The night was very cold.

SEP. 1st.—A cold autumnal morning. Swallows begin to increase in numbers, from the accession of the later broods of young. These birds as well as Martins fly very low to-day, skimming over the surface of the meadows and ponds in pursuit of their prey. The Pied Wagtails are very numerous, and begin to gather into small flocks.

4th.—*Achillaea Ptarmica* still in blow. Swallows fly low, indicating Rain.

5th.—Rainy morning, and fine clear night afterwards. The meadows are now yellow with *Apargia autumnalis*,

* The *A. autumnalis* most common here is the variety 3 of Withering's Botany. The leaves are extremely wingcleft, and the stalk tall.

† This plant was called *Leontodon* by Linnaeus; it was afterwards made a *Hedypnois*; then *Apargia*; and, lastly, in *Hort. Kewensis*, named *Trinchia*, and thus distinguished, "*Recept. plumosum, Pappus difformis Marginalis membrana multifida, centralis stipitata plumosa, Cal. octangulus octophyllus.*"—Second Edition, p: 447.

which, when viewed from a distance, present the appearance of a second spring.

6th.—*Viola tricolor* in flower.

7th.—Many varieties of *Papaver somniferum* still in flower in my garden.* *Boletus bovinus* here and there found. Also *Agaricus campestris* and *A. glutinosus*.

8th.—The Pheasant's Eye *Adonis autumnalis* in flower.

14th.—The Swans are observed flying against the Wind, which is reckoned here a sure indication of approaching Rain. The weather is again very warm; but the disproportion between the heat of the day and the cold of the night is increased.

Boletus bulbosus found. Swallows and Martins congregate in flocks. The Willow Wrens are still seen.

15th.—A warm, cloudy, lowering morning. Rain commenced in the afternoon. The Michaelmas Daisy *Aster tradescanti* in flower. Many of the summer plants still remain in blow. *Boletus bovinus* coming up here and there.

[Being absent some little time on a tour to Brussels and through the Netherlands, the continuity of this Calendar, as relates to TUNBRIDGE WELLS, has necessarily been interrupted. I have therefore substituted my observations made on the FLORA of the country through which I passed, and added collateral observations on this neighbourhood, made during my absence by competent persons, whereby the reader may in some measure compare the FLORA of the two climates. From the 14th instant the Calendar will commence again in the neighbourhood of TUNBRIDGE WELLS.]

21st.—I noticed among large flights of Rooks not only the

* A variety of the large white kind of Poppy occurred, whose capsule opened to emit the seed, like those of *P. horti*:—a circumstance which further corroborates the idea of this plant being only a variety.

Daws but the Starlings. I have not before noticed this bird mixed with Rooks.

25th.—*Vanellus Gavia* the Lapwing flies high, indicating Rain.

26th.—Fungi come forth, *Agaricus floccosus*, *A. stercorearius*, and others. Likewise *Boletus edulis* and *B. bovinus*. Showery day.

OCT. 2d.—Passing along to-day through Ardres, from Calais to St. Omer, I noticed *Apargia autumnalis* and *Papaver Rhæus* in blow in the fields. The *Cychorium intybus* was also abundant near the coast.

The trees in this part of the country, as in nearly all Flanders, are generally planted in straight rows, on each side the road. They are likewise thus disposed in the fields. I noticed that the Ash, Elm, and Beech trees rose with more smooth and longer trunks than the same trees do in England. They are likewise more naked of foliage till nearer the top of the tree. I have noticed this circumstance before in France, and also in Scotland, where walks planted with rows of trees near the towns are equally common as on the continent. I think, therefore, that the manner of disposing the trees together in rows may be partly the cause of this difference. *Agaricus fascicularis* is springing up by the road side.

3d.—Proceeding from St. Omer to Cassel, and thence through Balleul and Armentiere to Lille, I observed the same circumstance of luxuriant and tall trees with very naked trunks. The country was rich, the stubble entirely removed from the corn land, and the meadows very verdant. A great quantity of Stonecrop grew along the top ridges of the barns. In general Lichens and Mosses are less frequent here than in England. The buildings in Flanders are generally large, and

either slated or thatched, very old, and often with zigzag gable ends towards the street; but, owing probably to the greater dryness of the air, they do not so readily become covered with Moss. It is only here and there that one sees the tiled roof so richly yellow with Lichen and Moss as is very common in England. The Martins were still numerous. The weather rainy and warm.

4th.—Passing onward to Tournay, Ath, and Enghien, I observed very few things remaining in flower, except the *Apargia autumnalis* and a few Dandelions *L. taraxicum*. The country was more open and less planted hereabouts. We slept at Enghien; and in walking in the park and garden the next morning, I saw nothing in blow but a few Roses and Marigolds. The leaves were turned yellow and falling, and in a much more autumnal state than in France and England.

5th.—Gentle showers, with fair intervals. The country became more wooded again with Ashes and Beeches in rows as we passed through Halle to Bruxelles. The atmosphere is certainly more transparent than in the Eastern part of England; we saw the lofty spires of the Hotel de Ville of Bruxelles, and other high buildings, at a distance.

The *Aster Chinensis*, *A. Tradescanti*, and Marigolds, are most cultivated, and are now in blow in Belgium. The Aspen trees and Poplars are less common here than in French Flanders. The rows are seldom composed for long together of Lombardy Poplars, though I saw some of prodigious growth, considering they were first introduced on this side the Alps only about sixty years ago. The Limes are not so fine as in Kent, Sussex, and Surrey.

6th.—The road to Mechlin is uninteresting in a botanical point of view, being by the side of a canal made for the

treckschuyts and barges. The Marsh Groundsel was the only flower I saw.

7th.—Weather again rainy. At Antwerp I noticed abundance of *Agaricus campestris*. I likewise saw the *Boletus edulis* vended in the markets as an article of food. I made few observations on Natural History here, being taken up with the numerous antiquities and pictures with which this town abounds; but one thing I noticed (which shows the greater dampness of English air even compared with Dutch marshes), was, that the bells in the tower of the cathedral, and even those of the carillon, which are exposed in the open part of the spire, were free from rust, though bells of much more recent date in England become quite green with it.

At the Tête de la Flandre, on the West side the Scheldt, they keep the Yellow Wagtail *Motacilla flava* domesticated in the rooms to catch the flies, which are very troublesome.

In the marshes East of Antwerp, and in Holland, grows the *Senecio paludosus*.*

8th.—About Lookeren the country is marshy and flat, and abounds with windmills; but they are not so plentiful here as at Lille, where several hundred mills are employed to drain the suburbs of that city.

Near Courtray, where we slept, *Papaver Rhæas* begins again to be common; the road about Ghent, and all the way to Courtray, is lined with trees, and the country much enclosed. About Ghent I also noticed Oaks and a sandy soil.

9th.—At Ypres:—The Martins *H. urbanae* very numerous, and evidently congregating to depart.

* I saw this plant in abundance about Amsterdam and Haerlem, in August, 1822.

10th.—Weather fine and warm; we passed last night at Dunkerque. The POMONA seems very luxuriant this year throughout Flanders, particularly in Pears and Grapes.

In crossing the channel this evening from Calais to Dover, the captain noticed to me the quantity of Gossamer on the rigging of the vessel, which he said was a sure sign of fine weather.

On the 11th and 12th I noticed this web so abundant all the way through Kent, by Canterbury and Maidstone, to Hartfield, that the fields were quite white with it.

Swallows were numerous, and in large flocks on the coast and hills of Kent on the 11th.

13th.—At Hartfield the *Amaryllis sarniensis* in flower in the open ground. Of *Papaver somniferum* many varieties. *Agaricus muscarius*, *A. vercosus*, and others.

15th.—*Aster tardiflorus*, *A. Tradescanti*, and *A. Chinensis*, in full blow. The cold Northerly Wind, with frosty nights, which set in a few days ago, carried away all the Swallows. I have seen none since the 11th instant.

16th.—There are still some remains of summer flowers. The White Poppy, the Red Field Poppy, the Garden Crepis, autumnal Dandelion, with a few Roses, Geraniums, and Marigolds, still bloom. The Guernsey Lily *Amaryllis sarniensis* is still in blow, but begins to droop with the frost.*

* I noticed to-day a habit among Starlings *Sturni vulgares* which I have not seen mentioned in any works on ornithology. When they alighted on the grass, they sat in a regular circle. Pliny and other writers mention that these birds fly in a globular figure; but I have not yet seen any account of their sitting in a ring, nor can the reason of their choice of this position be easily assigned. Pliny says of their flight:—"In orbe volant omnibus in medium agmen tendentibus."

17th.—Riding between East Grinstead and Ryegate I saw large specimens of *Agaricus muscarius* growing by the road side, whose pilei measured above ten inches in diameter. The *Campanula rotundifolia* was still flowering in the fields.

20th.—*Senecio squalidus* (from a young seedling) in flower in the garden. *Tagetes patula* still in the cottage gardens.

21st.—*Agaricus floccosus* is springing up under an Apple tree, near the root. It came in the same spot about a week earlier last year. Several varieties of *A. integer* and *Boletus bovinus* are still common. Some flowers remain on the Canterbury Bells, which is very late in the season.

22d.—The fruit of the large Pumpkin Gourd *Cucurbita Pepo* gathered to-day. Some of them grew this year to an enormous size and weight. Weather changeable; clear Sky, Snow, and Rain, in the course of twenty-four hours.

26th.—Rapid transitions of cold and wet, with warmth. The nights become very cold and frosty, which has destroyed a great part of the Fungi. Some specimens of *Agaricus fascicularis*, *A. integer*, *Boletus bovinus*, and several *Helvella* and *Hypoxyla* still spring up.

NOV. 2d.—The Fieldfares *Turdi Pilares* begin to be seen in small flocks. A few flowers are yet seen here and there of the Periwinkle, the Dandelion, and the Autumnal Apargia. The Rains have again caused the Bundle Fungus *Agaricus fascicularis* to spring up abundantly. The Flock Fungus *A. floccosus* likewise remains in perfection at the stumps of trees, while in the meadows *A. glutinosus* abounds.*

3d.—*Adonis autumnalis* the Pheasant's Eye still flowers.

* The Fungi in general have been considerably less numerous this autumn than they were last. They were particularly numerous and of prodigious growth last year. The temperature, since the beginning of October, has been much lower than during the same period last year.

4th.—*Boletus scaber*, of Bulliard, *B. edulis*, *B. communis*, *Agaricus ovatus*, *A. fascicularis*, *A. floccosus*, *A. integer*, *A. muscarius*, and *A. lactiferus*, still found at Hartfield, and in Buckhurst Park; but in general they are decaying.

That curious little Agaric the *A. racemosus* was found in my field.*

5th.—Goldfinches *Fringillae carduelles* resort to the gardens in flocks, and feed on the seeds of the *Oenothera biennis*.

8th.—*Peziza coccinea* springing up near Buckhurst, in the same spot as last year.

16th.—Rainy weather; *Agaricus irregularis*, and several others, still seen. The mosses are late in appearing this season.

17th.—Rain the whole of the Day. A few Fungi re-appear.

19th.—The weather cold and raw. The last two or three days have produced a sensible change in the appearance of the country. The leaves are fallen, the temperature low, and the waters in some places are out in the low meadows that border the streams of the Medway.

21st.—Some of the summer flowers remain in solitary specimens here and there. Fieldfares continue to arrive in great abundance. The number of these birds are said to correspond with the degree of severity of the winters in the Northern regions. The circumstance of their great abundance,

* The more closely I examine the Fungi, the more convinced I become of the confusion and imperfection of the present systems and nomenclature: it is much to be wished that some person qualified would illustrate this hitherto unexplored branch of botany, and supply the deficiency by adding a correct account of cryptogamia to the Flora Britannica. I know of no person so qualified as M. Benjamin M. Forster, of Walthamstow, who has been for many years making researches into Fungi.

therefore, this year, may be interesting to those who are concerned about the situation of the Polar Expedition. The hedges this autumn are very full of Berries, which adds much to their picturesque appearance, and contributes to enliven this dreary season of the year.

DEC. 5th.—The following cryptogamous plants are now in fructification:—*Funaria*, *hygrometrica*, *Bryum hornum*, *B. caespitium*, and *B. roseum*; *Polytrichum commune*, *P. subrotundum*, and *P. nanum*; *Parmelia candelaria*, *P. ciliaris*, *P. prunastri*, *P. farinacea*, and *P. vitellina*; *Baeomyces furcatus*, *B. pyxidatus*, *B. fimbriatus*, and *B. farinaceus*; *Peltidea caninus*, *P. vinosus*, and *P. horizontalis*.

Besides the above, many species of *Jungermannia* and of *Hypnum* are in perfection, not yet examined as to species. *Dicranium pulvinatum*, *D. bryoides*, and *D. viridulum*, and *Neckera heteromalla*, and *N. crispa*, were found yesterday in fructification.

Several Sea Gulls were on the 2d instant seen at Croydon in Surrey; and the abundance of Fieldfares increases.*

Many flowers are as yet unblasted by the frosts. Some Periwinkles, Dandelions, and Mallows yet remain.

Some species of Orchis are appearing above ground. The weather continues very changeable, and, for the most part, cold and windy. Hares are particularly numerous this year,

* In alluding to different species of birds in the course of this Calendar, I shall make use of the generic nomenclature and the arrangement I have adopted in a small paper entitled, "Synoptical Catalogue of British Ornithology," which I lately composed, and which is published by Messrs. Nicholls and Co., &c., London, 1819; the arrangement and division of genera being founded on numerous dissections of the brain, and other parts of the birds, on the form of the cranium, the bill, &c.

and of late several Foxes have appeared in this neighbourhood; but this animal is, in general, very rare here, though so common in the bordering parts of Surrey.

The following plants, to which reference is made sometimes in this Calendar, have been discovered since the publication of the *Flora Tunbrigensis* :—

<i>Drosera longifolia</i> ,	<i>Spiloma decolorans</i> ,
<i>Festuca calamaria</i> ,	<i>Lecidea petraea</i> ,
<i>Parmelia perforata</i> ,	<i>Lecidea scabrosa</i> ,
<i>Parmelia borrieri</i> ,	<i>Lecidea ferruginea</i> ,
<i>Parmelia furfuracea</i> ,	<i>Polytrichum urnigerum</i> ,
<i>Parmelia Clementiana</i> ,	<i>Tragopogon porrifolius</i> , and
<i>Parmelia sophodes</i> ,	<i>Rosa Micrantia</i> .

After continued research, I cannot find that *Papaver somniferum* is wild hereabouts. This plant has been put down as such from specimens escaped by the fall of seeds from garden plants; neither are the other four species, so common elsewhere, by any means numerous in this neighbourhood.

1820. JAN. 14th.—At this hybernal season of the year there is, necessarily, very little movement in the vegetable kingdom. The Fauna alone presents objects of interest. The weather is still intensely cold, which drives many sea birds to the inland parts of the country. The Wild Duck *Anas boschas* is very abundant; and Wild Geese are said to have been heard performing their aërial migrations by night. Numerous small birds are found frozen to death on the ground. The Thermometer fell to 10°, that is, 10° below 0 of Farenheit.

21st.—Weather milder and thawed, but dark and gloomy. Narcissi begin to flower in warm rooms in the house. A curious variety of *N. Tazetta*, from Holland, is come into bloom in my room, having a duplication of petals, two of which are placed within the nectary.

Severe cases of small pox have again appeared: and, in general, I have noticed also an unusual prevalence of inflammatory complaints.

29th.—I noticed the Beeches and Oaks very destitute of decayed leaves this winter, owing, probably, to the late severe frost. The ground about Godstone, and all the way to Outwood, and about East Grinstead, is remarkably swampy, deep, and heavy to ride over. I scarcely ever remember it worse.

FEB. 1st.—Dead Nettle and Groundsel here and there seen in flower. The Fieldfares are nearly all gone from the gardens and yards near the house. In general, the number of small birds seems greatly diminished since December.

5th.—I observed, at Walthamstow, Snowdrops abundantly in flower this morning.

10th.—Some Crocuses *Croci vernaes* and the yellow *Narcissus Tazetta* in blow in the house. Weather mild and open. Likewise a few Snowdrops. Very large coveys of birds are still seen in this neighbourhood. And Wild Ducks abound in the ponds and marle pits filled with water.

15th.—Some other varieties of *Narcissus* begin to appear in a warm room. Out of doors there is scarce any indication of spring yet, the season being backwarder than last year.

Narcissus laetus, *N. Tazetta*, &c. in blow in the house. Bullfinches become numerous in the gardens.

23d.—*Galanthus nivalis* and *Heleborus hyemalis* in flower in the open ground at Maresfield. The birds begin to sing early and late. Some Crocuses *Croci vernaes* in blow under shelter of the house.

26th.—A return of N. E. Wind, and showers of sleet in the morning, which was very raw and cold. *Hyacinthus orientalis* in blow in the house.

MARCH 8th.—This was really a spring day, and was very fine, though the Wind remained Northerly. I noticed the Winter Hellebore in flower at Upton in Essex. *Primula vulgaris*, and its several varieties, called Polyanthuses, are in blow at Walthamstow ; and Snowdrops are numerous.

M. Benjamin M. Forster to-day discovered a curious vegetable phaenomenon in London Fields. On cutting down a Poplar tree, it was discovered that its roots, instead of descending into the ground, had returned upwards, and grown into the stump of the tree, which was thus nourished by a reabsorption of its own substance.

15th.—This was the first warm spring day: the air was mild and serene, and the temperature increased, though the Wind was North and East. Crocuses in full flower, and the purple variety of *Anemone hepatica*, at Walthamstow. Frogs and various insects come forth. Two Bats were seen flitting about in the evening.

16th.—Warm, and gentle South East Wind, and very fine afternoon. I observed the Willows, I believe *Salix caprea*, in bloom as I rode from Lanedon Hills to Brentwood, by Burstead: but this is certainly a late spring, compared with last year.

18th.—Primroses and some other spring flowers begin to be vended in the streets and markets of London. Several shrubs begin to bud.

Tussilago alba is still in full flower at Clapton.

22d.—*Viola canina* in flower in a warm situation at Walthamstow.

23d.—In a long ride through a large portion of Essex, by Abridge, Brentwood, &c. I had occasion to notice the extreme backwardness of the present season. I scarcely saw a wild plant out, though the day was fine ; and, had it not been for

the Crocuses and Snowdrops, which ornamented the gardens, and here and there Narcissi and Hyacinths in the windows of houses, one might easily imagine it February, instead of March.

24th.—*Viola odorata* just in blow; also the *Narcissus pseudonarcissus*, as well as its double variety, called the Yellow Double Daffodil. The Wind is Westerly, but the temperature rather low. I hear that the flowers of *Tussilago Farfara* were seen yesterday vended in London streets; but I have not yet seen this plant in flower. The Apricot is in blossom. A cold East Wind returned at night.

25th.—*Thlaspi Bursa Pastoris* the Shepherd's Purse in flower. Cold North Wind.

26th.—*Hyoscyamus Scopolia* in flower at Clapton, in T. F. Foster's garden.

29th.—*Ficaria verna** the Pilewort, and *Leontodon taraxacum* the Dandelion, in blow near Aldenham. In a field hard by I discovered also abundance of *Tussilago Farfara* the Colt's Foot. I hear that the *Daphne Laureola*, *D. Mezereon*, and *Pyrus Japonica*, flowered to-day; and that the *Papilio Io* was seen.

30th.—Butterflies and other insects begin to be common.

31st.—*Pulmonaria officinalis* in flower.

APRIL 1st.—This is a late season; not a leaf is to be seen yet. Crocuses, Snowdrops, Violets, Daffodils, Wallflowers, and the varieties of Polyanthus, and of the *Hepatica*, ornament the gardens and the thickets.

* The *Ranunculus ficaria* of some authors. This plant was first seen to-day in Berkshire, near Binfield, and in other places. It is probable that plants in very different places come into flower at the same time; the first warm day bringing them out.

In Berkshire, to-day, *Mercurialis perennis*, *Veronica agrestis*, and *V. serpillifolia*, in flower.

2d.—*Bellis perennis* the Daisy in flower. The lesser Pettychaps *Ficedula pinetorum* seen and heard.

3d.—*Draba verna* in flower.

5th.—*Narcissus minor*, and *Cynoglossum omphalodes*, in flower at Hale End, in a garden. Riding to-day, I observed a fine blow of Hyacinths *H. orientalis* of various colours, in full luxuriance, in the open air, at least protected only by an awning.

6th.—*Caltha palustris* in flower below the long bridge in the marshes. *Lamium purpureum* every where in bloom.

To-day the April showers began from the West, and the spring seems rapidly advancing; the Birds sing; Fruit trees are in blossom: and abundance of Daffodils are conspicuous in the gardens every where.

7th.—I observed the flowers of the Van Thol Tulip, and also the early Clarimond Tulip, in Covent Garden for sale. The double varieties of various Daffodils begin to be sold about.

8th.—The female Redstart first seen. The double varieties of *Narcissus laetus* in blow in the gardens.*

9th.—The leaves begin to bud. Dandelions, Pilewort, and other spring plants, begin to be common.

10th.—Dark day, with gentle showers from the South.

13th.—*Anemone nemorosa* in flower.

14th.—Moist, misty weather. I saw the Red Crown Imperial *Fritillaria imperialis*, and the varieties of *Primula*

* There is still some doubt respecting plants of this genus. The species I allude to is the *Narcisse des Jardins* of St. Hilaire, in his *Plants de la France*.

Auricula in flower to-day near Ilford, and the yellow variety of the former is just coming out. The Van Thol Tulip and Hyacinths and Narcissi also in blow. The Cuckoo first heard to-day.

15th.—*Primula elatior* the Oxlip in flower at Hartwell: the Van Thol Tulips and other garden plants are rather earlier here than in Essex.

16th.—*Cardamine hirsuta* and *Orchis mascula* in flower. A straggling Swallow seen at Hartfield.

17th.—*Narcissus elatior*, *N. bicolor*, and *N. calathinus* in flower at Hale End, besides several double varieties. *Narcissus Tazetta*, both the yellow and white sorts, now in flower in the open ground.

18th.—*Vinca minor* in bloom every where.

19th.—*Cardamine pratensis* and *Stellaria Holostea* in flower, but the latter is very scanty yet, and only out on a warm bank at Hartwell.

20th.—*Doronicum Pardalianches*, *Fritillaria imperialis*, three varieties, and many varieties of Daffodils, *Narcissus*, and Hyacinths, in flower in the garden at Hartwell. *Orchis mascula* in the fields.

Riding to-day through part of Surrey, Kent, and Sussex, I could not help noticing how rapidly the spring has advanced within a few days. Daisies, Pilewort, Periwinkles, Dandelions, Violets, Heartseases, Wood Anemones, Cowslips, and Primroses, are now very abundant, and adorn the banks and thickets in profusion every where. The Wryneck *Jynx torquilla* has been arrived some days; and I have already heard the Willow Wren *Ficedula salicem* and the Stone Curlew *Fedoa Oedicnemus*.

21st.—*Anomone hortensis* the Garden Anomone in blow.

22d.—The Swallow again seen: this bird is, however, of

rare occurrence as yet. The great Leopard's Bane in full flower. The Fruit trees are now in bloom; and the foliage advances faster than it did last year.

23d.—*Scilla nutans*, *Ranunculus auricomus*, and the Ale-hoof *Glechoma hederacea* in flower to-day. The Wood Anemone is abundantly in flower in the woods. Wallflowers begin to be common; and the *Oxalis Acetosella* is very numerous.

24th.—*Cardamine amara*, and *Ranunculus bulbosus* in flower. I saw, to-day, for the first time, several Swallows *Hirundines rusticae*, but stragglers have been so early as the 10th instant. Weather dry, with N. E. Wind.

25th.—The *Gentiana acaulis*, or Junckanella, as the country folks call it, flowered to-day. The cottage gardens in this neighbourhood are ornamented now with Stocks, Wallflowers, and Anemones. The Garden Ranunculi are also in bloom.

26th.—*Chaerophyllum sylvestre* in flower. Swallows fly low, denoting Rain.

27th.—Cold, showery, cloudy day, with Northerly Wind. *Tulipa Gesneriana* the variety called the Golden Eagle just in blow.

29th.—Narcissi, Crown Imperials, and Doffodils, still in flower, though much faded.

30th.—*Leucojum aestivum* in flower. A Swift *Hirundo apus* seen at Walthamstow.

MAY 1st.—*Veronica chamaedris* in flower. Fair day, but the temperature low.

2d.—*Erysimum Alliaria* abundantly in flower. The Swallow *Hirundo rustica* is become pretty common. A Solar Halo this morning.

3d.—*Senecio squalidus* and *Narcissus poeticus* in flower.

The Martin *Hirundo urbica* first seen, by me, to-day. This evening the abundance of Cirrocumulus and Wanecloud indicates Rain. The weather is very cold.

4th.—*Geranium molle* in flower.

6th.—I saw Trout, Perch, Bleak, and Roach, caught to-day in the stream. The day was cloudy and cold, with South Wind, followed by Rain and Gales at night.

9th.—As I returned from London, I observed all the way along that the *Ranunculus bulbosus* was become common, and spangled the meadows and fields with its rich yellow.

Hesperis inodora, *Iris Germanica*, and *Tulipa Gesneriana*, in bloom in the gardens. I saw here and there a very fine blow of Tulips about London. Near Edenbridge I observed the Yellow Asphodel *Asphodelus luteus* just coming into flower. The weather is warmer after the showers of last night. At Clapton, *Narcissus biflorus*, *N. poeticus*, and *N. angustifolius*, in blow.

10th.—*Papaver Cambricum* and *Peonia tenuifolia* in flower at Withyham, in a garden; where I also saw to-day the vernal bastard flower of the *Colchicum Autumnale*, which is a curious phaenomenon.

11th.—*Dentaria bulbifera* flowering at Withyham.

12th.—*Scandix odorata* in flower in a garden. The bulbous Crowfoot is abundant in the fields near Tunbridge Wells, and about London, and other places. The neighbourhood of Hartfield, however, is peculiarly destitute of this and other vernal flowers, the fields here looking quite like winter. This backwardness of the FLORA should be viewed in conjunction with the peculiarly great degree of cold which happened here almost locally in January last; the Thermometer here being many degrees lower than it appears to have been in any other part of the island. My Thermometer, on the night of

January 14, descended so low as ten degrees below zero ; and at midnight I saw another Thermometer so low as five degrees below zero. I forbear speculating on the cause of this circumstance ; but the comparatively late state of the vegetation here, and the destruction produced in the plants, corroborate the fact, without explaining its cause.

13th.—*Pyrethrum inodorum* has one flower already.

14th.—*Geranium molle* and *G. Robertianum* now common. *Myositis scorpioides* is also in blow, and the common *Tormentilla*, the *Potentilla*, Wild Mustard, Charlock, and others.

16th.—*Hieracium Pilosella* in flower on a warm bank, but it is not generally in blow yet.

19th.—**Hieracium murorum* in flower under a steep bank between Cowden and the high road.

20th.—*Sinapis arvensis* begins to abound.

21st.—*Hypochaeris radicata* in flower. This fine warm weather has in two days produced more flowers than, in the last preceding week, the Rain did. The *Iris lurida* is in flower in the garden. Nearly all the *Ranunculi* and *Potentillae* are in blow in the fields ; and the rapid growth of the midsummer flowering plants is prodigious. The meadows have now assumed their rich yellow bespangled appearance ; while in other places they are beautifully blue with the flowers of the Harebell *Scilla nutans* ; but still some few fields are almost flowerless, *Ranunculus repens* not being out yet.

24th.—NATALIS LINNAEI.—*Tragopogon pratensis* in flower at Hartfield. The weather extremely hot.

* I know not to what species to refer the *Hieracium* alluded to. I believe it to be a new one.

25th.—*Tragopogon porrifolium* in flower. In the gardens about London the *Lilium bulbiferum* is already in blow. *Papaver orientale* is in flower at Clapton and elsewhere. *Hypochaeris radicata* begins to abound.

26th.—*Chrysanthemum Leucanthemum* in flower. I also saw the *Papaver nudicaule* in blow in abundance in a garden in Penshurst parish.*

29th.—*Sonchus oleraceus*, *Lychnis Flos Cuculi*, *Saxifraga granulata*, *Hemerocallis flava* the Yellow Day Lily, and *Linum perenne* in flower.

30th.—*Aquilegia vulgaris* in flower. This plant is found apparently wild hereabouts, though I have never yet found it greatly remote from the houses.

31st.—The different varieties of *Azalea* are in beautiful bloom. The weather is still very showery, and the temperature low for the time of year. The rising of the Barometer is unattended now by fair weather; and the showers fall so rapidly, that one can scarce get away from them. The FLORA is very backward here. The meadows are hardly yellowed with Crowfoot in some places yet, particularly where the *R. Repens* grows. Some garden flowers, however, have been early this year, as Tulips and Crown Imperials.

JUNE 1st.—This month has set in with showery weather, which has continued for a long time past, while the temperature remains low, and the Wind South and Westerly. There is nearly twenty degrees of difference between the maximum heat of this and of last first of June. The VERNAL FLORA is passing away, while the SOLSTITIAL is backward in the

* This is the *Papaver erraticum nudicaule* of Dillenius, in Hort. Eltham. It is about the size of *P. Cambricum*, but the flower is of a paler yellow, and approaches more to sulphur colour.

gardens. The Purple as well as the Yellow Goat's Beard is in full flower; but this weather seems to retard its meridian closure of the flowers, often for above twenty minutes.

2d.—Weather showery. There are still in flower, in the gardens, *Iris lurida*, *I. Germanica*, *I. Pseudacorus*, *Hemerocallis flava*, *Hesperis matronalis*, *Aquilegia vulgaris*, *Papaver orientale*, *P. Cambricum*, *P. nudicaule*, *Asphodelus luteus*, a few Roses, &c.

3d.—Weather calmer and warmer, but we had a few gentle showers.*

4th.—Clouded and calm, with gentle showers. *Senecio squalidus* still in full blow.

5th.—*Cnicus pratensis* in flower in my garden; it is not common yet in the fields. I hear that the Corn Rose *Papaver Rhæas* is in flower at Walthamistow to-day; those sown in my garden are not yet in bloom. Rhododendra, Azaleas, and other shrubs, in flower.

8th.—The common Peony in flower.

9th.—The weather is now warmer, without much Rain; but the preponderance of clouded over clear Skies still prevails, and is unusual at this time of year.

10th.—*Lychnis dioica*, *L. flos cuculi*, the several Geraniums, the *Ranunculi*, &c. are now numerous every where. *Tragopogon porrifolius* and *T. pratensis* are numerous in blow; but in general the gardens are comparatively dull, the VERNAL FLORA having subsided, while the SOLSTITIAL plants, or those which come into flower about midsummer, are not yet out.

* This present showery weather, in this district at least, seems very wholesome; we have rarely had a season of less sickness. Is this from the peculiar electric state of the Rain and Atmosphere generally? For some rainy seasons are as remarkably unwholesome as the present is healthy.

11th.—*Papaver somniferum* in flower in my garden, from seeds which came up last autumn. (The petals are single, pale purple, and like those of the large white kind in shape.*

12th.—*Anagallis arvensis* the Wincopipe in flower, but its petals are closed on account of the showery weather.

13th.—*Papaver Rhæas* in flower in my garden. This plant in general blooms very early in the morning. As far as I can observe, each morning supplies a fresh set of flowers, and they soon drop off, and the capsule ripens.

14th.—*Ophrys bifolia* in flower in my field; likewise a variety of *Carduus Marianus*, without the milky streaks. *Valeriana officinalis*, *Lysimachia nemorum*, and *Dianthus barbatus*, are also in flower to-day; the latter is, of course, in the garden. I hear that *Papaver Rhæas* is now very abundantly in flower among the corn in Surrey.

15th.—*Digitalis purpurea* in flower on most of the banks. This evening the stratus filled the valley of the Medway, and indicated a change to fine weather—a sign alluded to by Virgil: “*At nebulae magis ima petunt, campoque recumbunt,*” &c.—See *Georg.* lib. i.

17th.—Fine morning. *Dianthus barbatus* the Sweet Williams, *Gladiolus communis* the Sword Flag, just coming into flower at Hartwell.

18th.—Riding to Merstham, I observed Corn Poppies *P. Rhæas* to begin to be common at Bleachinglye, though they are not numerous in all the fields there. In some places only, the fields are already quite scarlet with them; the soil being there a red sand, mixed with chalk; but on the Sussex side of the town, and in all this tract, of dun coloured clay and marle, about East Grinstead, and as far as Tunbridge Wells, there is scarce a Poppy to be seen, except in gardens.

* I shall notice the particular varieties from time to time, as I find old Gerard considered them to be permanent.

The *Lychnis dioica* is abundant by the road sides in Surrey, and the Germander Speedwell every where blooms on the braes.

19th.—*Carduus marianus* (*sine lacteis striis*) and *Hera-cleum sphondylium*, now in full flower.

20th.—*Gladiolus communis* the Corn Flag in full flower.

21st.—Weather calm and fair.

Lychnis chalconica just coming into flower. Poppies begin to be common ; though those sown in the spring are as yet small, and only just begin to rise up in the stalk. Sweet Williams and Pinks are also in bloom.

Oenanthe crocata in flower by the road sides.

22d.—I procured and sowed some of the seeds of the Maw Poppy, which are of a bluish grey colour. I take this to be the wild *P. somniferum*.

23d.—I found *Papaver Rhæas*, *P. dubium*, *P. Argemone*, and *P. hybridum*, all flowering near Brighton. I likewise saw the small variety of *P. Argemone*, which is by some persons mistaken for a new species, and called *Papaver maritimum*. In riding through Chaley, from Brighton to Hartfield, I observed that no Poppies were found nearer than Newark, and there were only a few there, perhaps one or two by accident. I should consider the tract of country devoid of Poppies (of which tract we may consider Crawbrough Beacon as in the centre), as extending to within five miles of the sea. When on the South Down Hills again, they are seen among the corn and other sown fields, though by no means so numerous as in parts of Surrey and Hampshire.*

* A work exclusively on the *Range and Distribution of the Habitats of Plants*, made out to correspond with maps of the strata, would be very interesting ; and if such a work were in the contemplation of any able person, I should be happy to contribute several observations which I have made on this subject.

26th.—Hot weather. Thermometer eighty four degrees in the shade. The Sky, though free from many definite clouds, nevertheless misty, and of a whitish hazy blue. The gardens are much improved by the change of weather. *Campanula Medium* and *Linum perenne* in flower already, besides numerous Poppies, Pinks, Roses, Carnations, the Yellow Day Lily, Heartseases, &c.

27th.—*Apargia hispida* in flower ; also *Rosa canina*. The weather hot, but the horizon always thick and misty.

29th.—*Lapsana communis*, and *Crepis tectorum*, and the Stonecrops.

30th.—*Crepis barbata*, *Convolvulus Nil.*, *Cnicus palustris*, *C. lanceolatus*, and *C. arvensis*, in flower. A few young plants of Leopard's Bane are still flowering. The Yarrow and the *Achillaea Ptarmica* are coming out, and the *Malva Moschata* was out this evening.

The Poppies, which are now numerous in blow every where, appear to me to have produced the same varieties from the same coloured seeds as they did last year ; that is, the seed of any particular variety produces the same variety again, perhaps out of a whole capsule of seeds, there being only one new variety, or *lusus*, which becomes a plant, the generality of whose seeds come up like the parent, that is, like the new *lusus*. And this seems the manner in which varieties of plants in general are formed and perpetuated. With regard to *Papaver somniferum*:—1. One variety has large round capsules, white petals, and white seeds. 2. The next allied to this has a capsule not quite so large and round, pale lilac petals, deeper purple at the unguis, and bearing dingy yellowish seeds. 3. The Garden Poppy, with black seeds, has many varieties, both single and double, the seeds being greyer in proportion as the colour of the petals is

lighter. The deep red kind, with blackish unguis to the red petals, produces black seed ; the lake coloured sort, dark grey seed ; the double white, yellowish or pale seed ; the cream and rose coloured, deep yellow seed ; and so on. These seeds produce again the same varieties.

JULY 1st.—This month commenced with cool fair weather, after the storms of yesterday. Notwithstanding the season has been very different, the plants have flowered at nearly the same time as last year, and some on the same day. The *Hypericum perforatum*, *Verbascum Lychnitis*, and *V. virgatum*, flowered to-day. I likewise first saw the Garden Chrysanthemum and the *Crepis barbata* in flower. Roses, Sweet Williams, Pinks, Convolvuli, Corn Flags, Poppies, and other solstitial flowers now ornament the garden in profusion. *Papaver Rhæas* and *P. dubium* are in flower numerously about Hartwell, from seeds sown by me in the autumn. Among the former I observe none of the variety with a dark spot at the base of the petals, so common in Surrey.

2d.—*Agrimonia Eupatoria* and *Senecio aquaticus* in flower ; they have the appearance of having been out a day or two. Weather showery again.

3d.—*Oenothera biennis*, *Hemerocallis fulva*, the greater and the lesser Garden Convolvulus, the Hawk's Eye, and others. *Achillea Millifolium* is abundant in the fields.

6th.—A white variety of the Foxglove in flower at Walthamstow ; also *Calendula officinalis*, *Tagetes Africana*, &c. Stocks, and other late flowers, are now abundant. A Poppy is now flowering with red petals, except a perfectly white unguis.

7th.—A white variety of the Garden Poppy in flower ; that is, with white petals, a glaucous leaf, small capsule, and

many flowers on one plant. The Narsurtium flowered first to-day. There are still some flowers of the Great Leopard's Bane yet remaining. By cutting down the old stalks as the blossoms fade, new ones will spring up, and then the plant will continue flowering all the early part of the summer.

8th.—Cool Day and Northerly Wind. Perch, Trout, Chub, and Roach, caught in the streams of the Medway at Hartfield and Withyham. *Malva sylvestris*, *M. Moschata*, and *Convolvulus arvensis*, in blow.

10th.—The Garden Chrysanthemum *C. coronarium*, Lupines *L. varius*, and *L. luteus*, in blow abundantly in the garden. The grass began to be cut to-day.

15th.—*Sonchus arvensis* in flower among the Oats, in a field beside the Withyham road.

16th.—*Lilium candidum* in flower in the gardens. *L. bulbiferum* has been in full blow some weeks.

20th.—Several Dahlias in flower in the garden. Weather fair, but with frequent Thunder showers almost every day. A Boletus, with a fox coloured pileus and yellow gills, is springing up near Stoneland Park; perhaps *B. edulis*.

23d.—*Papaver Argemone* in flower in the garden, which is late for this species. Nasturtiums are now in full flower.

26th.—*Althaea rosea* the Holyhock came into flower in my garden to-day. *Hieracium murorum* and *Doronicum Pardalianches* still in blow. The Purple Martagon Lily just in flower in my garden.

27th.—Riding to-day through Maresfield, Newark, Chailey, &c. to the sea side, I noticed a considerable advance in the SOLSTITIAL FLORA. *Lythrum Salicaria* was in blow by the river sides. *Sonchus arvensis* very abundant every where among the Oats, &c.; and the Fleabane *Inula dysenterica* was coming into flower. As I got into the chalky and sandy soils, I observed several plants in flower, which, not being

common on our clay here, may have been out in blow some days without my noticing them, such as the *Scabiosa arvensis*, *S. succisa*, *Centaurea nigra*, *C. cyanus*, *Chrysanthemum segetum*, *Anthemis nobilis*, and many others.

Walking by night on the high hills of the South Down, I noticed the most beautiful display of the Cirrocumulus, disposed like fine windrows of hay in lofty beds floating gently along in a serene welkin over the calm sea by moonlight.

28th.—*Campanula Trachelium* still in blow. The White Hedge Bindweed *Convolvulus sepium* begins to be common, and to hang its white bells about every hedge. The small species *C. arvensis* is also common. I found to-day that Red Poppies were common all the way from Brighton to Chailey, where they became rare, and at length disappeared.

30th.—*Lobelia urens* in flower in the garden. Fungi begin to appear. The Nasturtiums *Tropaeolum majus* now make a splendid figure, but begin to fade away.

31st.—*Campanula rotundifolia* in flower.

Being in Hampshire in August, the regularity of the Calendar was omitted.

SEP. 1st.—This month set in with fair weather, a steady Barometer, and clear nights, with stratus.

2d.—Falling Stars observed to-night. The Moorhen *Fulica chlorossus* noticed in the ponds.

4th.—A Falling Star was described to me by a person this evening as descending and running along the ground: it was probably an *Ignis fatuus*.

7th.—During the Eclipse the Thermometer fell from ninety three degrees (in the Sun) to seventy degrees.

18th.—I found *Agaricus muscarius*, a beautiful crimson Fungus with white spots, in abundance, growing on the grass in Stoneland Park. *Boletus edulis* is also common.

19th.—The Autumnal Crocus, or Saffron, in blow.

21st.—Sweet Peas, African Marigolds, Dalias, and China Asters, are still in blow in the gardens ; and here and there a few Poppies. The *Monarda didyma* flowers at Hartwell Farm.*

29th.—The following plants still flower, though sparingly, and are much injured by the cold nights, and by the hard Rains occasionally :—*Calendula officinalis*, *Tagetes patula*, *T. Africana*, *Dahlia superflua*, *Chrysanthemum coronarium*, *Papaver Rhæas*, *P. dubium*, *P. somniferum*, and *P. Cambriticum*. *Apargia autumnalis* still abounds in the fields.

Swallows and Martins congregate and prepare for departure.

30th.—*Agaricus floccosus* and *A. fascicularis* springing up, though neither have been of any considerable magnitude yet. Fungi are certainly scarce this year. Swallows and Martins begin to assemble in flocks. Large flights of Starlings are also numerous already.

* 1821. MAY 1st.—Fine warm weather. The Peony coming into flower. Swallows still rather scarce. *Papaver Cambricum* just in flower at Hartwell.

3d.—Stocks in flower in the gardens. Tulips now in full blow. *Chaerophyllum Sylvestre* in flower in the fields. The Wryneck *Iynx torquilla* is arrived, and heard daily.

This season is, in many respects, backward ; in others, by no means so. The leaves are less forward on the trees than usual ; but the flowering of plants has occurred at the usual period. Those local abscesses, called *Furunculus* and *Authrax*, are said to be very common this spring.

10th.—Returning home through Croydon, I first observed Martins *Hirundines urbicae* ; but it is probable they have

* This plant is here called the Balm of Gilead.

appeared ten days or a fortnight ago, though not noticed by me. *Senecio squalidus* in full flower.

11th.—*Chaerophyllum Sylvestre* in flower. *Hieracium Pilosella* on warm banks.

13th.—*Iris lurida* and *Convallaria majalis* in flower.

14th.—*Iris Germanica flore albo* now blows. Weather showery.

Papaver Cambricum in full blow.

15th.—*Hirundo apus* the Swift first seen. Sand Martins have been seen some days.

17th.—A day of Rain. Martins and Swallows fly low, and skim about the pond. *Senecio squalidus* in full flower. This plant has become quite a numerous weed in my garden. It is found wild no where in Britain, except the walls about Oxford.

18th.—*Hieracium murorum* in flower near Cowden. A few Fungi appear at this unwonted season.

19th.—*Tragopogon porrifolius* in flower against the porch of the house.

Chrysanthemum Leucanthemum just coming into flower.

21st.—*Hesperis inodora* the Motherwort. Poppies come up badly, and will be very late in flower this year. Cold and unfriendly weather to vegetation.

23d.—Cold N.E. Wind, with clouds and some Rain. The progress of vegetation seems retarded.

24th.—NATALIS LINNAEI.—The weather cold and unseasonable, and vegetation quite at a stand.

26th.—Cold N. W. Wind, and Hail shower. The Thermometer, at 10, P. M. thirty seven degrees. The common Peony just in flower. The *Peonia tenuifolia* has finished flowering. *Aquilegia vulgaris* in full flower. The Poppies are hardly up yet, and are at least a fortnight later than last year.

27th.—We experienced to-day a most extraordinary degree of cold for the time of year. During the fall of a shower of sleet, the Thermometer fell to thirty nine degrees of Farenheit at two o'clock in the afternoon. The germination of plants seems quite suspended; the last week having produced no ostensible alteration in the gardens and fields. The *Agapanthus umbellatus*, which lived through last winter in the open ground, seems to suffer much from the frosty nights. The Crowfoot, the Harebell, and other field flowers do not show their wonted brilliancy.

31st.—Sharp Easterly Wind to-day, nothing seems to grow.

JUNE 1st.—*Iris pseudacorus* flowers. The Bees have all died this spring.

3d.—*Hemerocallis lutea* in blow. Young Starlings already seen about.

4th.—*Papaver orientale* in blow near the Mill Pool, going to Cowden.

JULY 1st.—A showery day.

2d.—A day of rain. On returning to Hartfield from Hampshire, I noticed that some plants were rather forwarder at the former place than at the latter; but in general there was very little difference. Scarlet Strawberries plentiful.

3d.—*Papaver somniferum* at last coming into blow in the garden.

Lychnis Chalcedonica just opening its flowers—very late this year. Sweet Williams are now abundant.

4th.—*Senecio aquaticus* in flower.

5th.—A variety of *Carduus Marianus*, without the milky streaks; now flowers in my garden. Charlock, Kidlock, Mustard, Cress, and many of the kind of tetradynamious plants, are now in full flower, and give many of the fields a

smart, yellow appearance. The Foxglove is also abundant, and in the gardens a profusion of Sweet Williams, Pinks, and Roses. The Wild Roses have flowered late and badly this season.

7th.—Several Poppies now begin to flower, though this —*P. somniferum*—has, in general, been near three weeks later this year than last.

8th.—*Oenothera biennis*, and the Goat's Beard, and Welch Poppy still blow.

10th.—*Hemerocallis fulva*.

11th.—St. Barnabas *Crepis barbata* flowers, though badly. *Cyrysanthemum segetum*.

Agrostemma githago.

12th.—*Lapsana communis*.

13th.—*Convolvulus tricolor* and *Sonchus arvensis*.

The *Convolvulus arvensis* plentifully.

15th.—St. Swithin again showery.

16th.—*Tropaeolum majus* plentifully in blow.

19th.—A great variety of Poppies now in full flower. A large Boletus found.

20th.—St. Margaret. *Sillium bulbiferum* still in blow.

22d.—Within the last week, or ten days, the Willow Wrens—*Ficedula salicum* and *F. pinetorum*—have been very numerous. I have also seen the *F. sylvicola*.

23d.—*Lillium candidum* at length in flower, though very late this year.

The Scarlet Lichnis still very abundantly in flower.

Lillium Martagon still blows.

Senecio squalidus flowers.

26th.—Showery weather, with very drying and sunny intervals. Having several Cherry Clacks in the garden and orchard, I had an opportunity of noticing, by the varying

degrees of strength in their clacking noise, that the Wind came in puffs, or very irregular gales.

27th.—*Papaver Rhæas* still bears flowers abundantly. *P. dubium* in flower also in my garden.

28th.—*Carduus Marianus* still flowers. *Papaver dubium*.

30th.—*Tagetes erecta* just coming into flower in the garden; and several sorts of Garden Hawkweed.

31st.—*Hieracium umbellatum*.

AUG. 4th.—*Althea rosea* in flower. Canterbury Bells going out of flower, as is also Love in a Mist.

17th.—*Agaricus muscarius* found.

19th.—A remarkable blue colour of the Sun noticed by M. Benjamin M. Forster of Walthamstow.

22d.—*Amaranthus hypochondriacus* flowers.

SEP. 1st.—*Lilium tigrinum* in flower. Garden Poppies continue in full blow.

3d.—*Helianthus annuus* the Sunflower now blows.

4th.—*Adonis autumnalis* in flower. Marigolds common.

13th.—The Wind has destroyed the Sunflowers.

21st.—*Boletus bovinus* and others.

Gnaphalium stoechas in blow.

24th.—*Fringilla linota* congregates.

27th.—*Aster tardiflorus* and *Colchicum autumnale*.

28th.—*Dalias* in flower.

OCT.—*Hieracium murorum* now has its second or autumnal flowering. White Blue Bottle in flower.

25th.—*Aster Chinensis* and *Tagetes erecta* still in flower.

27th.—*Agaricus fascicularis*.

NOV. 1st.—*Agaricus floccosus*: a great many plants continue in flower.

26th.—*Scabiosa atropurpurea* still in flower with Chrysanthemums and many others.

DEC. 4.—*Tussilago fragrans* the Shepherd of Madonna in blow, whose odorous blossoms we smelled at a great distance.

Helleborus hyemalis in flower.

This is a very unseasonably mild winter, and we have numerous garden plants still in flower.

18th.—A flight of Teals seen in the grove and above the wet marle pits.

* 1822. JAN. 1st.—*Tussilago fragrans* the Shepherd of Madonna in flower, and scenting the air with its odorous blooms.

2d.—Bullfinches observed to be numerous.

9th.—Large flocks of Rooks pass over to feed of a morning, and as usual I observe numerous Daws among them.

Vinca minor the Periwinkle in flower here: this plant in mild weather blows all winter.

11th.—*Primula verna* the Primrose, and the Polyanthus in flower in the garden. Weather very mild. The garden infested with small Slugs, and some unseasonable blossom buds on the Willow. Wild Ducks and other waterfowl heard.

19th.—*Lamium purpureum* the Dead Nettle in flower.

24th.—*Viburnum Tinus* the Laurelstine in blow.

25th.—St. Paul's Day is this year fair and clear.

28th.—The Primrose in flower on the banks by the road side.

29th.—*Galantha nivalis* the Snowdrop already flowers.

FEB. 2d.—Candlemas Day windy. It blew violently as I returned home from Clapton, and at night became boistrous from the South with Rain, making good Virgil's lines:—

“----- *Non Eure tuum neque solis ad ortum*

In Boream Caurumve, aut ubi nigerrimus Auster

Nascitur et pluvio contristat frigore cochum.”

6th.—*Anemone hepatica* in flower in a Southern aspect.

Tussilago alba plentifully.

8th.—*Crocus vernus* the Spring Cocus in blow to-day ; but neither this plant nor the Snowdrop are yet very numerous, though the latter has been out this fortnight.

17th.—The Yellow *Narcissus Tazetta* in flower in the house ; also the Blue *Hyacinthus orientalis*. The bulb of this plant being injured last year, produces now a very curious distorted flower. I observe to-day the Crocus, the Snowdrop, and the Double Daisy to flower abundantly in all the gardens.

18th.—*Viola tricolor* the Heartsease in flower.

19th.—At a gardeners at Cowden I saw a plant of the *Scilla Peruviana* flowering of immense size ; I afterwards purchased it. Its floraison now is an unseasonable anticipation of its proper period by at least two months.

24th.—The following is a list of plants, belonging to the PRIMAVERAL FLORA, now in blow :—

Primrose, numerously.

Cowslip, here and there one.

Polyanthus, many varieties in gardens.

Daisy, both single and double var. common.

Peruvian Squill, in the garden in a pot.

Star Windflower.

Hepatica, both the purple, the white, and the blue.

Mezereon.

Periwinkle.

Crocus, several varieties.

Snowdrop, still flowering.

Early Daffodil.

Roman Narcissus, double white and orange.

Papyraceous Narcissus, white with pale cups.

Heartsease.

Violet.

27th.—I observe the Crown Imperial just shooting up above ground.

MARCH 1st.—*Leontodon Taraxacum* the Dandelion begins to flower in a few warm places here and there.

Daphne Mezereon makes a beautiful figure in the garden.

2d.—Lunar Halo in a thin Wanecloud.

3d.—*Ficaria verna* the Pilewort in flower on a bank at Hartfield, but not common yet: it is seldom numerous before the end of this month.

5th.—*Hyacinthus botryoides* the Grape Hyacinth in blow in the garden at Walthamstow.

Scilla amoena is said to be already blowing, as was told me by M. Dickson the botanist this morning. Daffodils, Croci, Double Daisies, and other early plants, now profusely decorate the gardens.

Tulipa suaveolens in blow in the house, with many varieties of *Narcissus Tazetta*, *N. orientalis*, *Hyacinthus orientalis*, and others.

8th.—The Yellowstriped or Scotch Crocus in blow.

9th.—*Chiranthus cheiri* the Wallflower already out.

Calendula officinalis the Marigold, and *Narcissus laetus* in the gardens, this latter plant is called the Great Jonquil. There is another variety closely allied to it and hardly distinguishable, called *N. Odorus* by Curtis, but both have a delicious odour.

10th.—The White Violet in blow in the garden.

14th.—My father showed me a perfectly new *Narcissus*, resembling the early Daffodil, in flower in his garden.

16th.—Pilewort now flowers abundantly on banks, and in shady groves by thickets. The Early Daffodil is also very abundant.

Limaceous reptiles very troublesome this spring.

18th.—*Narcissus incomparabilis* just in flower.

19th.—*Fritillaria Imperialis* coming into blow in my garden.

Cheiranthus cheiri flowers here and there. The banks begin to be covered with the Primrose pale and Violet blue.

20th.—*Doronicum Pardalianches* in flower.

22d.—*Narcissus Tazetta flava* in the open ground.

23d.—The New Moon happened to-day, and esteemed by the country folks unlucky. A prejudice exists here against Saturday's Moon, as being productive of stormy and bad weather. The Stone Curlew heard now by night: yesterday for the first time. The Snowdrops are now quite out of flower and gone.

24th.—*Narcissus bulbocodium*.

Cyclamea Europoeum.

Leucojum vernalum.

Narcissus orientalis albus flavo nectario.

25th.—*Charadrius Oedrinemus* the Stone Curlew again heard by night.

26th.—*Cardamine pratensis*.

Cardamine hirsuta.

Stellaria holostea.

Sinapis arvensis. I noticed the above plants in flower to-day as I rode to Tunbridge Wells.

27th.—*Ranunculus bulbosus* just out. The Crown Imperial now common. A piece of the root of Leopard's Bane, which had been completely crushed last winter, revived this spring, and to-day produced the strongest flowers in the garden.

29th.—Windflowers common in my garden.

30th.—Two more varieties of the Oriental Narcissus in flower out of doors.

31st.—Water Wagtails common. Lunar Halo.

APRIL 1st.—Clarimond Tulips in flower.

2d.—*Senecio squalidus* begins to open its flowers.

4th.—*Cynoglossum omphalodes* in flower. The Thrush sings.

5th.—*Caltha palustris* abundantly.

Orchis mascula. Both yellow and red varieties of the Crown Imperial still in blow.

17th.—*Hirundo rustica* the Swallow seen.

18th.—Common Tulips in flower, but not yet quite full blown.

22d.—*Scilla nutans* the Harebell, sparingly. This is the *Hyacinthus non scriptus* of the old botanists.

23d.—*Symphetum tuberosum*.

Borago officinalis.

24th.—*Galcopsis versicolor*. Already the bulbous Crowsfoot is become common.

25th.—*Gentiana acaulis* the Junkanella.

27th.—*Narcissus bicolor* in my garden.

29th.—*Veronica Chamaedris* abundant.

Cuculus canorus the Cuckoo heard.

Papaver Cambricum. Tulips are now abundant and full in blow

MAY 1st.—*Narcissus biflorus* in the garden.

Narcissus Papyraceus of Curtis again in blow; it flowered on the 24th of February last.

2d.—*Iynx torquilla* the Wryneck heard.

3d.—*Hieracium Pilosella* the Mouse Ear in flower near Rusthall Common, on a warm bank.

4th.—*Paeonia tenuifolia* flowers in the garden already.

5th.—*Narcissus Poeticus* in the garden in flower. The weather very warm and fine, and the season forward. I observed one flower open on a plant of *Papaver orientale* at Withyham, where I saw the *Iris Germanicum* in flower.

- 6th.—*Graphalium Stocchas*.
 8th.—*Hirundo apus* the Swift arrives.
 9th.—*Poeonia corallina* flowers in the garden.
 10th.—*Convallaria majalis* the Lily of the Valley.
 11th.—*Aquilegia vulgaris* the Columbine.
 12th.—*Hirundo urbica* the Martlet first seen by me—very late this year!
 14th.—*Iris lurida*.
Scabiosa atropurpurea the Musk Flower.
Haemerocallis flava the Yellow Day Lily.
Asphodelus luteus the Asphodel.
 16th.—A small Poeony in flower, which I take to be the *Poeonia peregrina*.
Doronicum Plantagineum.
Ornithogalum umbellatum.
 17th.—*Chrysanthemum Leucanthemum* the Midsummer Daisy in flower to-day.
 18th.—*Hypochaeris radicata* the Cat's Ear.
 19th.—*Tragopogon pratensis* the Meadow Goat's Beard.
 20th.—*Tragopogon porrifolius* the Purple Goat's Beard.
Hieracium murorum.
 24th.—NATALIS LINNAEI.—*Linum perenne* in blow.
 25th.—*Iris Pseudacorus* the Yellow Flag.
 26th.—*Convolvulus tricolor* the minor Garden Bindweed.
Campanula Speculum Veneris the Venus' Looking Glass.
 27th.—*Lychnis Flos Cuculi* the Ragged Robbin, abundant in the meadow grass.
 29th.—*Lychnis dioica* near Lindfield.
Papaver Rhæas near Brighton.
 31st.—The above plant flowered in my garden.
 JUNE 1st.—*Gladiolus communis* the Sword Lily.
Tropocolum majus, one or two flowers.
 4th.—A Poppy which stood the winter in flower.

Campanula Medium, with very pale flowers.

Potensilla Anserina.

7th.—*Mimulus luteus* the Monkey Flower.

9th.—The Red Poppy and the Canterbury Bells begin to flower abundantly.

14th.—*Lychnis Chalcoedonica* the Scarlet Lychnis just coming into flower: the flowering of this plant is everywhere a sure mark of the approaching Summer Solstice. It may be called the King of the SOLSTITIAL FLORA.

Hemerocallis fulva the Copper Day Lily flowers.

15th.—A pink coloured variety of the *Papaver Rhæas* in flower.

Papaver somniferum in blow. I noticed the large White Official Variety in my garden.

17th.—*Hieracium sylvaticum* in flower.

Malva sylvestris also out.

18th.—The Monkey Flower now in full blow. Dalias in flower.

19th.—The Musk Flower *Sabiosa atropurpurea*.

20th.—*Verbascum Virgatum* and *V. Lychnitis* flower in my garden.

Oenothera biennis flowers in all the gardens. The Canterbury Bells begin to decline and fade away.

26th.—*Lillium Pomponicum* in blow.

Lillium candidum just in blow.

JULY 2d.—*Convolvulus sepium* flowering.

4th.—*Nicotiana Tabacum* just out.

Senecio Montanus.

8th.—*Sonchus Palustris* in blow. Cherries very plentiful, but so numerous were the devouring Sparrows on the trees, that three Cherry Clacks would not keep the fruit from their attacks.

13th.—*Inula Helenium*.

16th.—I noticed the great abundance of White Hedge Bindweed all the way to Canterbury and Dover.

17th.—Crossed to Calais with a light breeze in a steam vessel. Travelling along this afternoon to Boulogne, we noticed the immense quantity of Butterflies covering whole fields for miles together.

18th.—Violent Storm of Thunder and Lightning this evening at Amiens.

19th.—In travelling through Beauvais and St. Dennis to Paris, I noticed the great abundance of *Cychorium Intybus* which grew by the road sides, and afterwards noticed this to be the case over a great part of the Continent.

20th.—St. Margaret's Day. I noticed that the luxuriance of the flowers in the Jardin des Plants had been diminished by the late hot weather.

24th.—We proceeded to Melun, where I noticed that the atmosphere was warmer than at Paris. Rambling about the environs in the evening, I was struck with the great quantity of Apricots, Plums, and other fruits. The disease in the Trachea, commonly called the Croop, was very prevalent here, and had swept off a considerable number of children. The verdure was much faded with the late hot weather, and I could distinguish a yellow autumnal cast round the leaves of the *Populus Italicus*, which grows round the public walks of the town.

25th.—Breakfasted at Chatelet, a village in a flat open country; and, having dined at Sens, we arrived in the evening at Auxerre. The atmosphere clouded over at night, and we experienced a heavy Storm, which was followed by Rain.

26th.—Leaving Auxerre early we rested at Lucy-le-bois, and proceeded by Avallon and Rouvray to Pont-y-Pani, where we passed the night in the back kitchen on a wretched matrass, the house being full. The room swarmed so of

Flies, that in some places the wall was quite black with their settling on it. Thunder, Lightning, and some Rain occurred during night.

27th.—On arriving to breakfast at Dijon we were struck with the neatness of the town, and the pure and healthy atmosphere. The day became remarkably fine as we proceeded to Dôle, in approaching which through an extensive plane we saw the Jura Chain of Mountains, forming a bold and striking back ground to the landscape. At Dôle the air was clear, and though the Sky was freer from vapour than either at London or Paris, yet I saw none of the deep azure which is spoken of as the colour of the welkin in the more Southern parts of France. The gilded cupolas, or rounded tops of the steeples, in all this part of the country have a fanciful appearance at a distance, when viewed through this clear air of an evening. I noticed abundance of Plums in the large garden of the inn, and some Apricots. They speak of having had such terrible heat during last month in Burgundy, that the greatest part of the fruits are burnt up.

28th.—This afternoon we ascended the Jura and slept at Champagnole, prettily situated amid mountain scenery and forests of Spruce Firs, and a few Pines. I found most of our common syngenesious plants by the road sides.

29th.—We continued our route to-day over the Jura, and passed some beautiful scenes and romantique precipices in going by way of Les Rousses to Gex in Switzerland. In descending from the mountain to the latter place, the most magnificent view of Mount Blanc and the mountains of Savoy presents itself across the Lake of Geneva. This grand scene was, however, soon changed for obscurity, and a violent Thunderstorm fell just as we got in. We afterwards proceeded to Nyon on the Lake, during another of those violent Storms, which in this country as well as in Wales come on

very suddenly. I forbear to fill up this paper with the detail of many atmospheric phaenomena observed here, as they have been so accurately described by Sassure in his *Voyages des Alpes*.

30th.—Fine morning, but the mountains were cloudcapped. Violent Storms returned, and at night at Vevay a soaking Rain came on.

31st.—Proceeded from Vevai to Moudon and Payerne, through a pleasant subalpine country. At this place the costume and the manners of the Paysannes begin to change.

AUG. 1st.—The costume of the Canton of Tribourg was conspicuous in the market place of Payerne early this morning. At breakfast I met with a Swiss gentleman who had been cured of the goitre by the application of Iodine. We proceeded to Morat on the Lake, a very old town under arcades and surrounded by a high wall and towers, whose lofty roofs were yet standing. I noticed that some Apples on a tree near one of the gates were nearly ripe. We arrived at Berne to dinner, and were struck with the neatness and magnificence of the town, in which are many beautiful fountains, and the Alpine views from the walls are extremely grand. By the road side I gathered seeds of various syngenecious plants, particularly Apargias and Leontodons, but all were likewise common plants in England and France; and I found but few Alpine novelties in Switzerland.

2d.—We proceeded to Thun, on the Lake of the same name: it is a romantic and beautiful place, and the prospect of the Jungfrau and other lofty Mountains from the Lake on which we sailed is particularly striking. After a clear day, Rain came on. At night the air in this country is certainly dryer than in England. The roofs of the clock towers in the towns were rarely covered with Moss, though many of them were very old.

3d.—Passing through a great part of the Canton of Berne, we noticed the peculiar neatness of the large and commodious wooden cottages, inhabited by the Paysans of this Canton. We arrived at Soleure in the evening: the climate here is sensibly cooler than at Geneva. At night, rambling round the town walls, it became quite cool.

4th.—A beautiful ride to Basle, where however the weather became wet and gloomy, to which the sombre though neat appearance of the town with its cathedral of red stone contributed. I noticed Swallows and Martins flying over the Rhine; these birds, however, are in general very scarce this year.

5th.—Weather fine. Grapes and Melons, with abundance of fine Pears and Peaches. I slept at Colmar in Alsace: in travelling over the extensive planes of which, we saw several Storks on the wing, and some other large unknown birds. We noticed also the immense number of small Field Mice by the road sides.

6th.—A cool East Wind blew strong all the way to Strasbourg, and contributed to a tooth ache with which I was suffering. The air was very clear, and the steeple of the cathedral was very conspicuous a long way off.

7th.—Crossed the bridge of boats over the Rhine, and slept at Bischoffsheim.

8th.—Went early to Baden, a beautiful watering place in a romantic country.

Travelling along a sandy road to Baden, I noticed the effect of the late hot weather in destroying vegetation.

9th.—Showers returned with Thunderstorms, and a cooler air, travelled by way of Corlesruhe to Manheim. Walnuts already plentiful in the markets; and Plums and Prunes growing in abundance by the road sides, seemed well coloured and nearly ripe. Peaches and Nectarines abundant.

10th.—Proceeded to Mayntz. Weather warm and clouded.

11th.—Proceeded to Coblentz, where we arrived late. Weather cooler again.

12th.—Travelled along the Rhine, whose banks here are covered with ruins of ancient castles and other buildings. Slept at Cologne. Garden flowers much cultivated here, on the outside of the town's walls.

13th.—*Cycorium intybus* still common by the road side in going to Geldern.

14th.—Crossed the water into Holland at Nimwegen, and went to Ardringen, along the top of the Dyke, to sleep.

15th.—The road to Uterecht lay through a flat country, with rows of trees on each side ; as we approached Amsterdam the road run by the side of ornamental canals and rich luxuriant gardens of flowers belonging to *maisons de plaisance*, the residence of rich retired merchants.

16th.—*Senecio paludosus* very common by the sides of the Dutch Marsh Ditches. Dined at Haerlem and slept at the Hague. *Butomus umbellatus* also flowered in the same places.

17th.—At the Hague weather cooler.

18th.—Arrived at Breda this evening, by way of Rotterdam and Dortrecht.

19th.—Weather warm and clear again at Antwerp. Slept at Bruxelles.

20th.—At Ghent. Weather warm and close.

21st.—Hot day at Bruges. Signs of Thunder Storms in the evening. I mounted the Belfrey of the Town House, and noticed that the Bells of the Carillon had no rust on them, which would not have been the case in a damp climate.

22d.—Proceeded to Calais.

23d.—Crossed in the steam packet to Dover. Wind strong from the North. *Convolvulus sepium* still abundant.

24th.—At Hartwell. Weather cooler, and with some Rain at night.

* 1823. JAN. 1st.—Calm but cold weather. *Tussilago fragrans* still in blow, but not so fragrant as when it first came into flower on the 10th of November last.

8th.—Mottled red clouds at Sunrise, then gilded like gold. N. E. Winds prevail.

14th.—The Wind howls as if Snow was coming.

15th.—It snowed all the day.

18th.—Very cold, the Thermometer fell to 10°. Snow on the ground.

25th.—St. Paul's Day is cloudy this year, with some Snow and Sleet falling, and E. Wind.

FEB. 2d.—A damp wetting Candlemas Day. There were no Snowdrops in flower this year in my garden, as is usual on the Feast of the Purification; but a few were just opening in a warmer situation at Hartfield Parsonage, where the Star Anemone was in flower.

3d.—*Vinca minor* in flower at Hartwell and at Withyham.

4th.—*Galantha nivalis* in flower at Hartfield Parsonage to-day, as I saw myself, abundantly.

12th.—The Winter Hellebore, the Snowdrop, and the Spring Crocus, are just in flower in my garden; the two former are prodigiously late this season, and have probably been retarded by the severe frost of January.

19th.—*Tussilago alba* in flower in the garden. *Tussilago fragrans* is also still in blow, but fading.

23d.—*Crocus vernus* now in full blow.

24th.—The Star Anemone *A. hortensis*, the Primrose *Primula verna*, and the Daisy *Bellis perennis*, came into flower in my garden, though very sparingly and badly.

27th.—I noticed the Starlings feeding in the meadows.

MARCH 1st.—The Snowdrop and Winter Hellebore in flower in M. Edward Forster's garden, at Hale End House, Walthamstow. Very late spring.

4th.—The White Striped Crocus is now in blow. The common Yellow Crocus and the Snowdrop abundantly.

6th.—Zephyrs again breathe, but the spring is very backward, and the PRIMAVERAL FLORA makes no show yet. The Snow still lies in particular cold places on the hills.

11th.—Hyacinths and Narcissi in flower in the house, in pots, where also the Van Thol Tulip is beginning to blow.

13th.—Wavy WanecLOUDS forebode a change.

14th.—*Daphne Mezereon* in flower.

20th.—*Narcissus pseudonarcissus* the early Daffodil just coming into blow.

21st.—*Narcissus lactus* begins to blow. Primroses begin to be common, as well as the garden varieties of Polyanthus.

22d.—I observed the Blue Crocus to-day; this is the latest sort to flower, the other kinds have been abundant a long time past.

Tussilago farfara in flower.

28th.—*Hyocyamus Scopolia* said to be in flower in M. Thomas F. Forster's garden at Clapton. As I returned from London to-day, I observed that there was no appearance of spring, not the least budding of leaves.

30th.—Beautiful morning, with great variety of the modifications of clouds.

31st.—*Viola odorata* and *V. alba* in flower.

APRIL 1st.—Warmer air. This evening the Bat, the Dor Beetle *Scarabaeus fimetarius*, and Toads abound.

2d.—*Doronicum Pardalianches* the Great Leopard's Bane in flower.

3d.—*Motacilla alba* the Wagtail seen.

4th.—*Ficaria verna* the Pilewort in flower.

6th.—*Fritillaria Imperialis* the Crown Imperial.

9th.—*Hyacinthus Orientalis* out in the garden. Clarimond and Van Thol Tulips coming into blow.

13th.—*Narcissus incomparabilis* in flower. A Swallow seen to-day.

19th.—Quite a spring day, with a hard shower of Hail before noon. The banks begin to be beautifully covered with Primroses and Violets, and here and there bespangled with Pilewort.

20th.—The Crown Imperial, both the yellow and the red variety, in full blow in my garden and elsewhere.

22d.—*Cardamine pratensis* Our Lady's Smock common.

23d.—Showery and wet again with Wind. The Cuckoo heard.

27th.—*Caltha palustris* in the moist meadows.

29th.—*Narcissus bicolor* in my garden; also a variety of *N. orientalis*, with very large flowers of white petals and yellow large nectariums. A few Swallows seen about. Cowslips abundant.

MAY 1st.—*Gentiana acaulis*. A very backward appearance for May Day. I noticed Cowslips, Primroses, Dandelions, Our Lady's Smocks, Polyanthus, Daisies, and other plants, in the garlands which the girls brought about to-day.

The Peach trees are in beautiful blossom, and the Apple trees coming out rapidly, with also Cherries; but in general these trees are much later than last year, and are always a week later here than they are near London.

This spring has been hitherto remarkably unwholesome, and particularly fatal to persons advanced in years.

2nd.—*Narcissus biflorus* came into flower among the numerous bulbous plants in my garden in the orchard.

3d.—*Orchis mascula* called Ram's Horns in flower.

Ranunculus bulbosus came into blow. Martins seen.

4th.—*Tulipa Gesneriana* first in flower to-day. The earliest of these common Tulips that blow are the yellow and brown called Golden Eagles, the varieties of red and white are a few days later.

Cheiranthus Cheiri the Wallflower common, though not full out yet.

Stellaria holostea.

5th.—*Stellaria graminea*.

6th.—*Narcissus poeticus* in flower.

Senecio squalidus. Warm weather; the fields here white with Daisies, there gilded with Dandelions.

7th.—*Calendula officinalis* an old plant of the Marigold.

The sounds of Waterfowl and other noises heard afar off, sure to portend Rain.

8th.—*Paeonia tenuifolia* blowed to-day in the garden.

Symphetum tuberosum and *S. asperinum*, with another hybrid variety, just opening. The signs of Rain exhibited all yesterday and to-day at length have been followed by a rainy and windy night.

9th.—By the following list of plants now in blow, it will be seen how large a proportion belong to the PRIMAVERAL FLORA and how few to the VERNAL FLORA:—

PLANTS FLOWER.—The Double Early Daffodil, scarcely faded away.

Great Scented Tonquil, still remaining in flower.

Peerless Daffodil.

Oriental Narcissus, several varieties fading—

- Great Daffodil.
Great Leopard's Bane.
Oriental Hyacinth, three varieties.
Star Anemone or Windflower, the blue, the purple, and the red varieties.
Polyanthus, many varieties.
Primroses, every where on the banks.
Cowslip, abundant in the meadows.
Oxelip, several wild among Primroses.
Pilewort, still bestarring the shady places in numbers.
Periwinkle, both greater and less.
Sweet Violet.
Dog's Violet.
Forster's Tunbridge Violet.
White Violet, just fading, in gardens.
Heartsease, in the garden.
Wallflower, abundant since the third.
Yellow Bachelor's Buttons, being a Double Crowsfoot.
Dandelion, bespangling the meadows with gold.
Daisy, numerous in some places.
Harebell, in flower about a week, the ground blue with it in some places.
Scented Chervil.
Gentianella, in my garden.
Tulips, scarcely in blow, many not yet.
Bulbous Crowsfoot.
Twoflowered Narcissus.
Poetic Narcissus.
Narrowleaved Poemony.
Venus' Navelwort.
Germander Speedwell.

9th.—The Swift *Hirundo apus* first appeared to-day. This bird arrived at nearly the same time last year. I observe a good many of the Bulbous Crowsfoot in flower; also the double garden variety of the Meadow Crowsfoot, called Bachelor's Buttons. Wallflowers plentiful.

Borago officinalis in flower, though the plant is as yet small.

Glechoma hederacea also flowering.

10th.—*Asphodelus luteus* just coming into flower to-day. This appears to be the sort of Asphodel cultivated by the Romans.* The Air is soft and the Sky cloudy, with a few very gentle showers in large and distant drops: a beautiful day for observing the colours of flowers, which, excepting certain red ones, are not seen so well in Sunshine. I first observed to-day the *Bellis perennis* to be so numerous in my fields, that they may be called *Meadows Trim with Daisies' Pride*. The Dandelion and Bulbous Crowsfoot are plentiful, nor has the Pilewort ceased yet to ornament the grassy and shaded banks with its gilded stars. The beds of Tulips are scarcely in full blow yet, though nearly so: they make a splendid appearance in this sort of weather. One remarkable *lusus* has occurred, viz. a Tulip whose stalk bears several smaller flowering stalks, so that, by thus branching out, one root bears five flowers.

11th.—*Senecio squalidus* in full flower.

Calendula officinalis the Marigold

Campanula speculum a single selfsown plant or two.

Aethusa cynapium.

Scandix odorata.

The Narcissus tribe are now fading away, except the poetic and the bilflorate, which are called May Lilies here, just as the early sort are called Lent Lilies.

* See Phillips on Cultivated Vegetables, article Asphodel.

12th.—*Ranunculus acris* the Upright Meadow Crowsfoot coming into flower in the fields.

13th.—*Ranunculus repens* the Creeping Crowsfoot just flowering in the garden. The above two species are here in general about a fortnight later than the Bulbous Crowsfoot already noticed.

Trollius Europæus the Globe Flower in blow at Eaden Bridge and elsewhere.

Scilla campanulata already common in some gardens: it came into blow to-day in mine.

15th.—Returning home from London to-day, we had occasion to notice the great abundance of the Harebell *Hyacinthus non scriptus* this year: an extensive piece of rising ground at Limpsfield Park was quite blue with it. The Apple trees showed a great quantity of blossoms. The Upright Crowsfoot begins to be common.

16th.—*Veronica Gentianoides* just in flower; also the Pike Geranium. The Tulips begin to fade.

17th.—*Iris Germanica pallida* in blow: it is merely a white variety.

18th.—*Pœonia officinalis* coming into blow.

19th.—The Meadows yesterday and to-day have produced an abundant crop of Dandelions in seed.

20th.—*Papaver Cambricum* in flower on a broken stone wall, in a shady situation in the garden.

Lychnis dioica under the hedges beyond Chailey.

Iris Germanica at Brighton and elsewhere.

21st.—*Trollius Asiaticus* in a garden at Uckfield, where I also noticed abundance of Tulips and Gentianellas. Anemones begin to go off.

24th.—The VERNAL FLORA is backward this year: the Chesnut trees now make a beautiful figure.

25th.—*Aquilegia vulgaris* the Columbine in flower to-day. The fields begin to be now yellowed with the Crowsfoots, to which have just yielded Dandelions and Daisies. The Yellow Azalea in blow to-day.

26th.—*Hypochaeris radicata* in blow to-day.

Hieracium murorum just open.

27th.—*Hesperis inodora* in flower.

Allium luteum also open.

28th.—*Papaver orientale* called Monkey Poppy came into flower this morning in my garden, and its brilliant red colour had a very showey appearance.

Poeonia corallina, with deep crimson flowers, in blow to-day in my garden.

Tragopogon porrifolius also first flowered.

Poeonia humilis in blow ; this is a smaller species than the common Peony, and the colour of the flower is of a more purplish crimson.

29th.—The Garden Blue Bottle *Centaurea montana* flowered, as well as a variety with straw coloured flowers.

Papaver dubium the Doubtful Poppy flowered to-day, which I considered very early, particularly as the season is in most respects very late for other tribes of plants.

30th.—A warm day followed a morning stratus.

Doronicum plantagineum still in full blow: this plant flowers about the same time as the Great Leopard's Bane *Doronicum Pardalianches*.

Dodecatheon Medea in flower at Withyham.

Rosa micrantha in flower at Hartwell.

31st.—Columbines of many varieties are become numerous. Crowsfoots are now numerous in the meadows richly gilded with their yellow flowers.

JUNE 1st.—*Papaver Rhæas* flowered this morning in my garden ; but it was only a flower or two which opened : just as *P. dubium* flowered a few days ago. The great mass of Poppies of both the above sorts do not flower till about the Solstice. The Yellow Goat's Beard is just out, and the Purple Goat's Beard already common. The Foxglove is also just opening. Warm and dry days and cool nights, however, still retard the vegetation of young plants of all kinds.

2d.—The following plants flowered this morning :—

Iris pseudacorus the Yellow Flag.

Hemerocallis flava Yellow Day Lily.

Digitalis purpurea Fox Glove just opened.

Gladiolus communis opened a few flowers.

Dianthus deltoides the Deptford Pink.

Lychnis flos cuculi the Ragged Robin.

The day was fair, but the clouds and signs of a change encreased, and a fine Rain came on at night.

3d.—*Hieracium pilosella* the Mouse Ear is abundantly in flower every where, and has been out for two or three days : this plant is certainly later than usual, but many of the later plants came to their time, and some are even early. The Cat's Ear is very common already. Blue as well as White Valerian now common.

Ranunculus flammula Spearwort in flower to-day in moist places.

4th.—Roses begin to be common, though they are late this year.

5th.—A small yellowish single flowered Turk's Cap Lily is now in full blow in my garden, which I take to be a small specimen of the *Lillium pomponium flavum*. The weather continues showery.

6th.—*Papaver somniferum* came into flower in my garden; and there are several specimens of *P. dubium*, and *P. Rhæas* with its garden varieties. There are several Foxgloves already in blow, as are several varieties of Hesperis.

8th.—*Mimulus luteus* the Monkey Flower in blow.

9th.—A calm clouded growing day. Poppies of all sorts begin to blow abundantly, and will be numerous by the Festival of St. Barnabus, the time of year when they usually first appear, so that this cold and backward spring, which retarded the Primavera and Vernal flowers, is early with respect to the Solstitial plants. I have already noticed a flower or two on the Sweet Williams, but this plant can hardly be reported yet as blowing.

Allium flavum is in full blow. Peonies and Leopard's Bane going out. Roses are become common. All the fruit blossoms, which were late this year, are already over.

11th.—St. Barnabas.—*Sonchus coeruleus* of T. F. Forster, the Blue Sowthistle in flower. Mild weather and much cloud; the FLORA advances rapidly, and vegetation is luxuriant. I conceive it may be adviseable to give a list of all the plants in blow in the garden on certain stated days, in order to convey to persons in distant climates a more correct idea of the climate and seasons here, than can be done by the Floral Calendar alone. The VERNAL FLORA may be said now to have passed its culmination and the SOLSTITIAL to commence; consequently I indicate the state of the blossoms of each plant now in blow.

Great Leopard's Bane, just going off.

Peony, all the sorts begin to shed their flowers and to decay away.

Garden Poppy. This plant in its several varieties begins to be plentiful.

Corn Rose or Red Poppy, frequent in the garden, but not common in fields yet.

Long Smoothheaded Poppy or Doubtful Poppy, in the garden and elsewhere frequent.

Welch Poppy, going off.

Hesperis, in full blow.

Monkey Flower.

Sword Lily, or Corn Flag, just out.

Rhododendron, in full blow.

Yellow Azalea, beginning to decline. The above two, however, make a fine and conspicuous figure.

Roses, of several sorts, beginning to blow plentifully.

Indian Pink, just blowing.

Fraxinella, just in flower.

Foxglove, beginning in gardens.

Monkey Poppy or Oriental Poppy, still in blow, and is to be considered late this year; but I observe some plants of this species flower a fortnight earlier than others.

Garden Pink, hardly come out yet.

Globe Flower, both European and Asiatic still blow.

Blue Bells or Harebells, nearly gone.

Blue Bottle, two varieties in full flower.

Purple Goat's Beard.

Yellow Goat's Beard.

Columbines, of many varieties.

Yellow Day Lily.

Yellow Allium.

Marigolds, which have stood the winter.

Valerian, both the blue and the white.

The German Iris, both blue and white.

Heartsease still abound.

Yellow Turk's Cap Lily.

All the Crowsfoots are now common, and the meadows are spangled with their yellow. Mouse Ear, Cat's Ear, Rough Dandelion, Wall Hawkweed, Red Campion, Meadow Lychnis, and various other plants blow.

18th.—*Campanula Medium* in flower to-day.

20th.—*Lychnis Chalcedonica* just coming into blow.

24th.—St. John Baptist's Day.—*Tropaeolum majus* just in flower on a warm dry bank here and there. The remainder of the Roses are come out, and the SOLSTITIAL FLORA advances. Orange Lilies blow near London.

25th.—*Hieracium Sylvaticum* in flower. Marigolds.

27th.—*Malva Sylvestris* here and there in flower.

28th.—*Convolvulus tricolor* flowers in the garden.

Lillium bulbiferum now in blow here. Also the Cockle *Agrostemma coronaria*.

JULY 2d.—*Crepis barbata*.

3d.—*Oenothera biennis*.

10th.—*Convolvulus sepium* begins to blow here and there.

13th.—*Lillium candidum* the White Lily in flower.

14th.—*Campanula rapunculoides* in flower at Hartwell.

This season has been unkindly for many particular tribes of plants. The China Asters in particular are all blighted, and will not grow.

THE Calendar must now close, and the Author apologizes for numerous imperfections, owing to his never intending the early part of it for publication.

EXPLANATION OF THE PLATES.

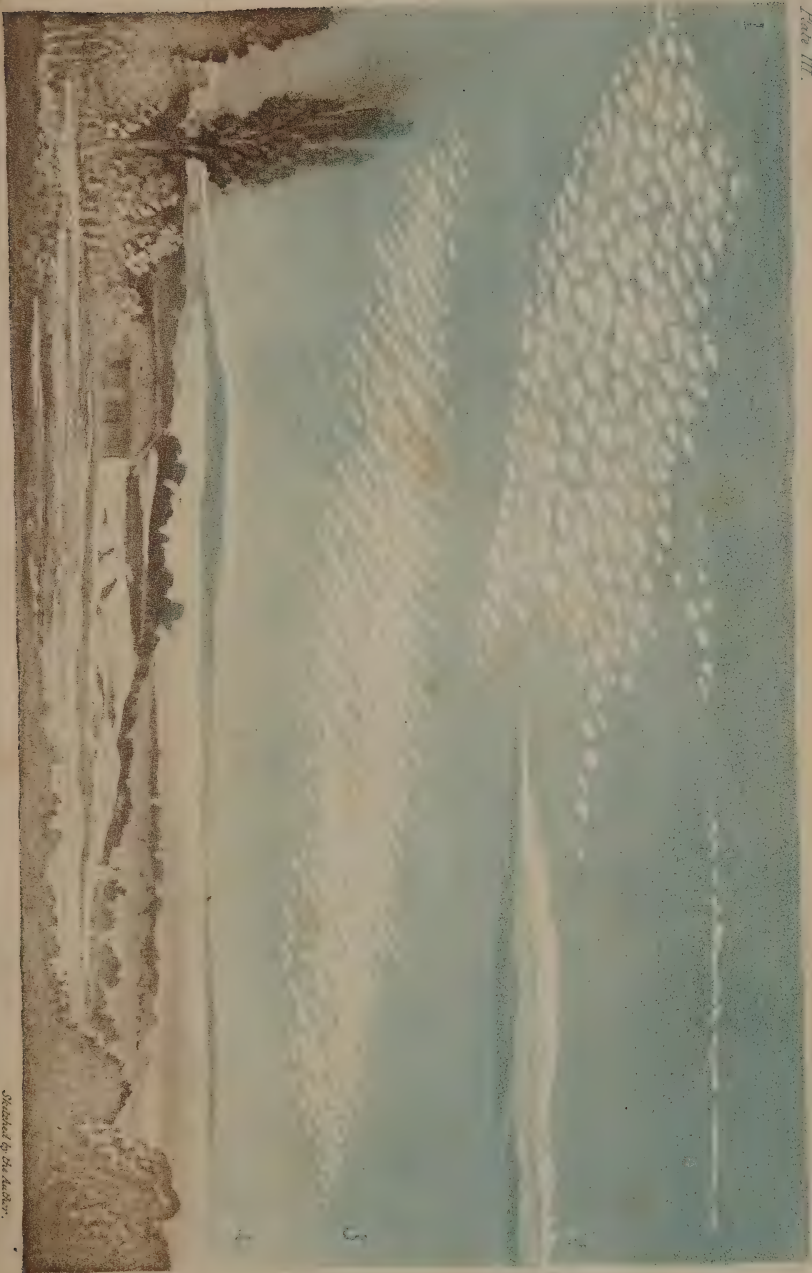
- PL. I. Fig. 1. Represents a Comoid Cirrus. This is the variety called the Mare's Tail.
Fig. 2. A Cirrus lengthened out into a long pointed tail, above it is a long straight Linear Cirrus.
Fig. 3. Are Cumuli; others are seen below them in the distance.
- PL. II. Fig. 1. Cirrus beginning to change to the Cirrocumulus.
Fig. 2. The Cymoid Cirrostratus a stormy feature of the cloud.
Fig. 3. Nascent Cumuli forming in the top of the Stratus soon after Sunrise.
Fig. 4. A fine thin Stratus ascending in the morning.
- PL. III. Fig. 1. A Cirrocumulus.
Fig. 2. A Cirrostratus seen in profile.
Fig. 3. A Mottled Cirrostratus, there is a cirrocumulative tendency in its barred nubeculae.
Fig. 4. Another long Cirrostratus seen in profile in the horizon.
- PL. IV. Fig. 1. Another Cirrus figured like the Cyma of Architecture.
Fig. 2. Lines of Cirrostratus.
Fig. 3. The same cloud breaking out into Cirrocumulus for being influenced by the Cumulostratus below.
Fig. 4. Cumulostratus. Many of the long Cirrostrati alight on its summits.
- PL. V. Fig. 1. A Nimbus pouring Rain.
Fig. 2. The Cirrose Crown.
Fig. 3. A dense feature of Cirrocumulus often seen before Storms.
Fig. 4. Little Cumuli entering the Storm from below.
- PL. VI. (*Frontispiece*,) Fig. 1. A Halo.
Fig. 2. A Double Halo.
Fig. 3. A Discoid or Coronoid Halo.
Fig. 4. A Corona or Burr.
Fig. 5. A Parhelion.
Fig. 6. A Caudate Meteor or Falling Star.

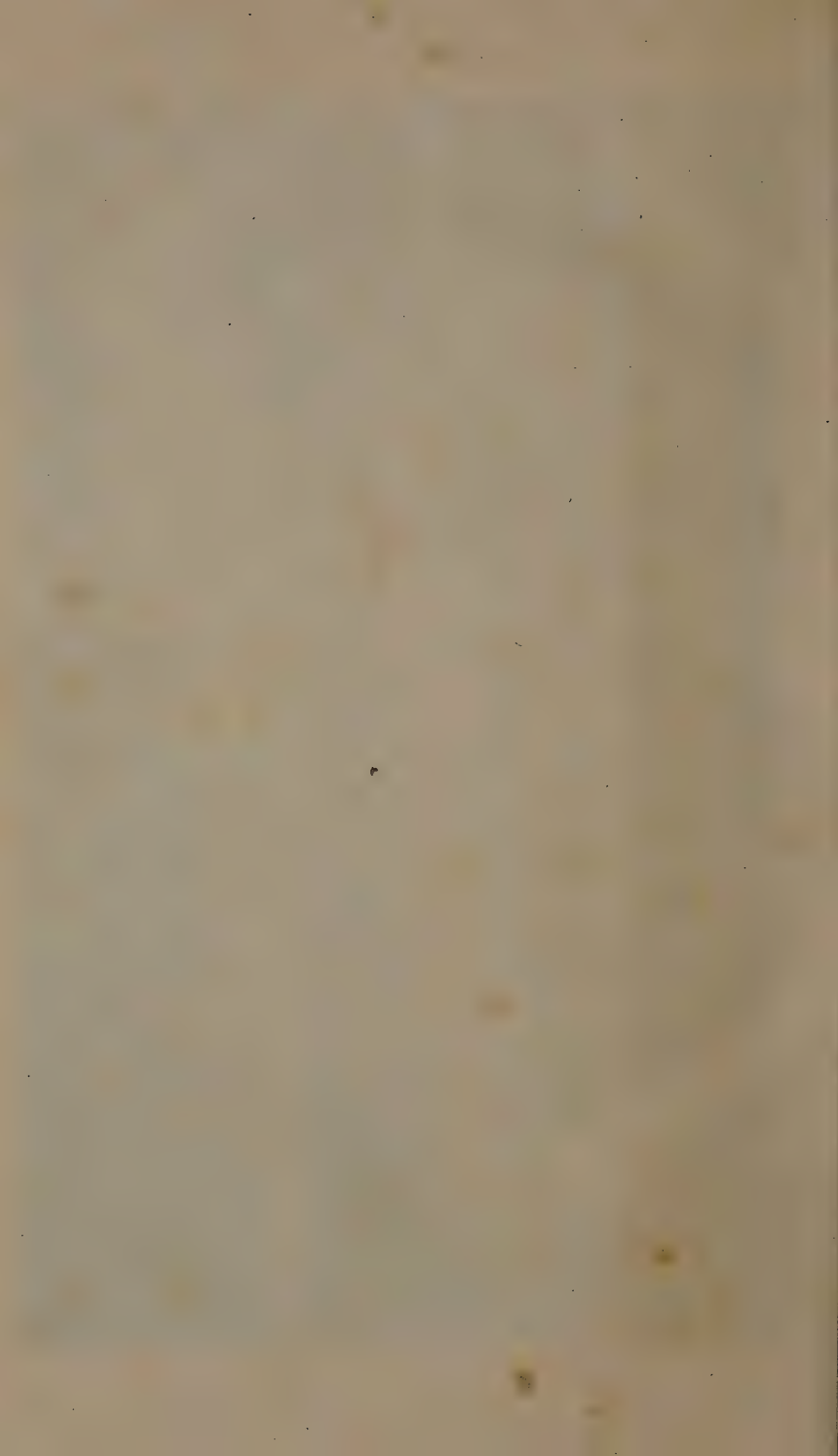


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Revised by the author.







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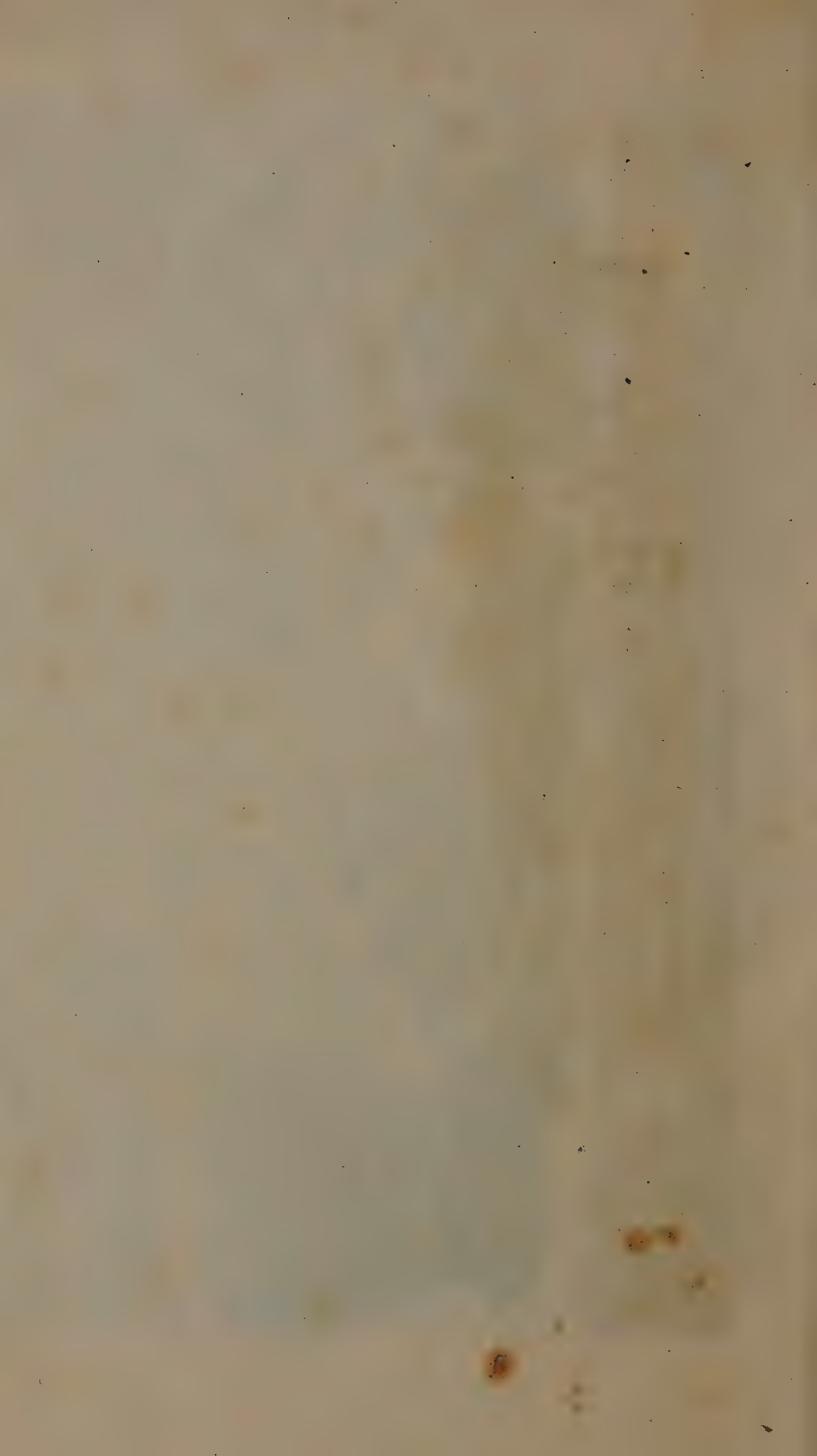
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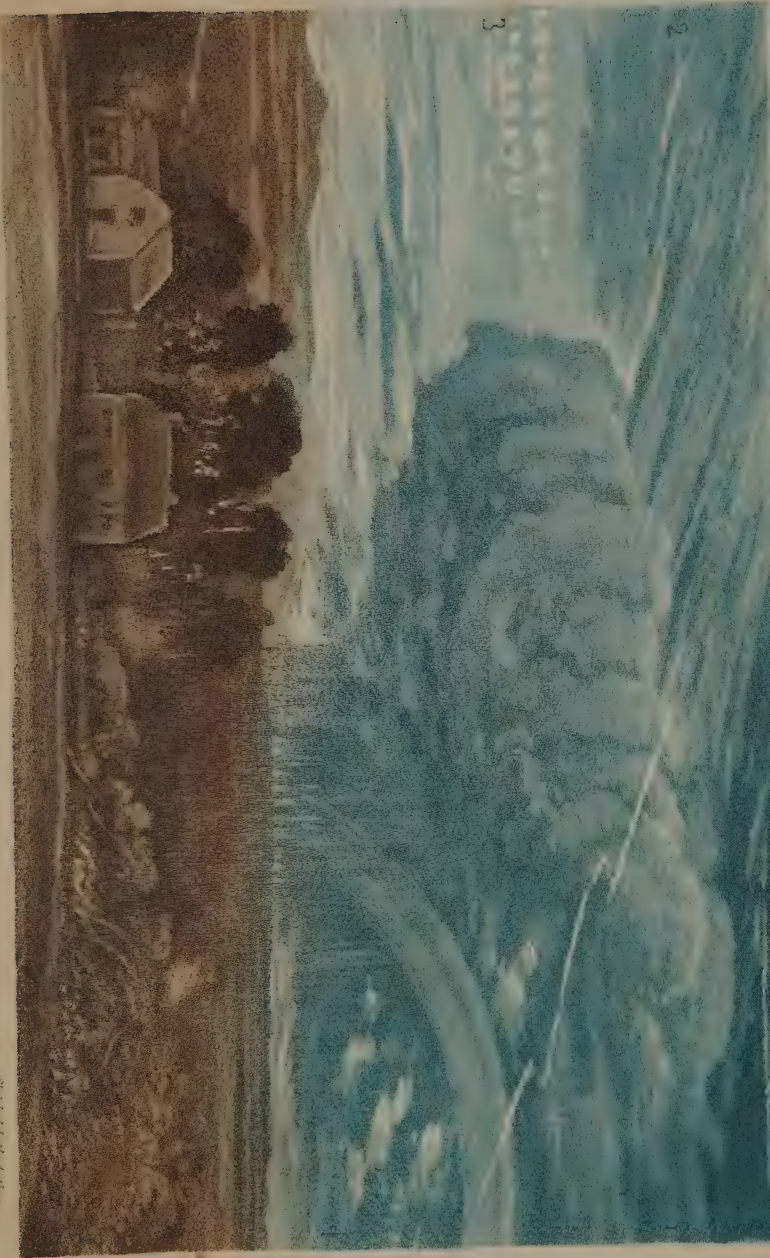
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Sketches by the Author.

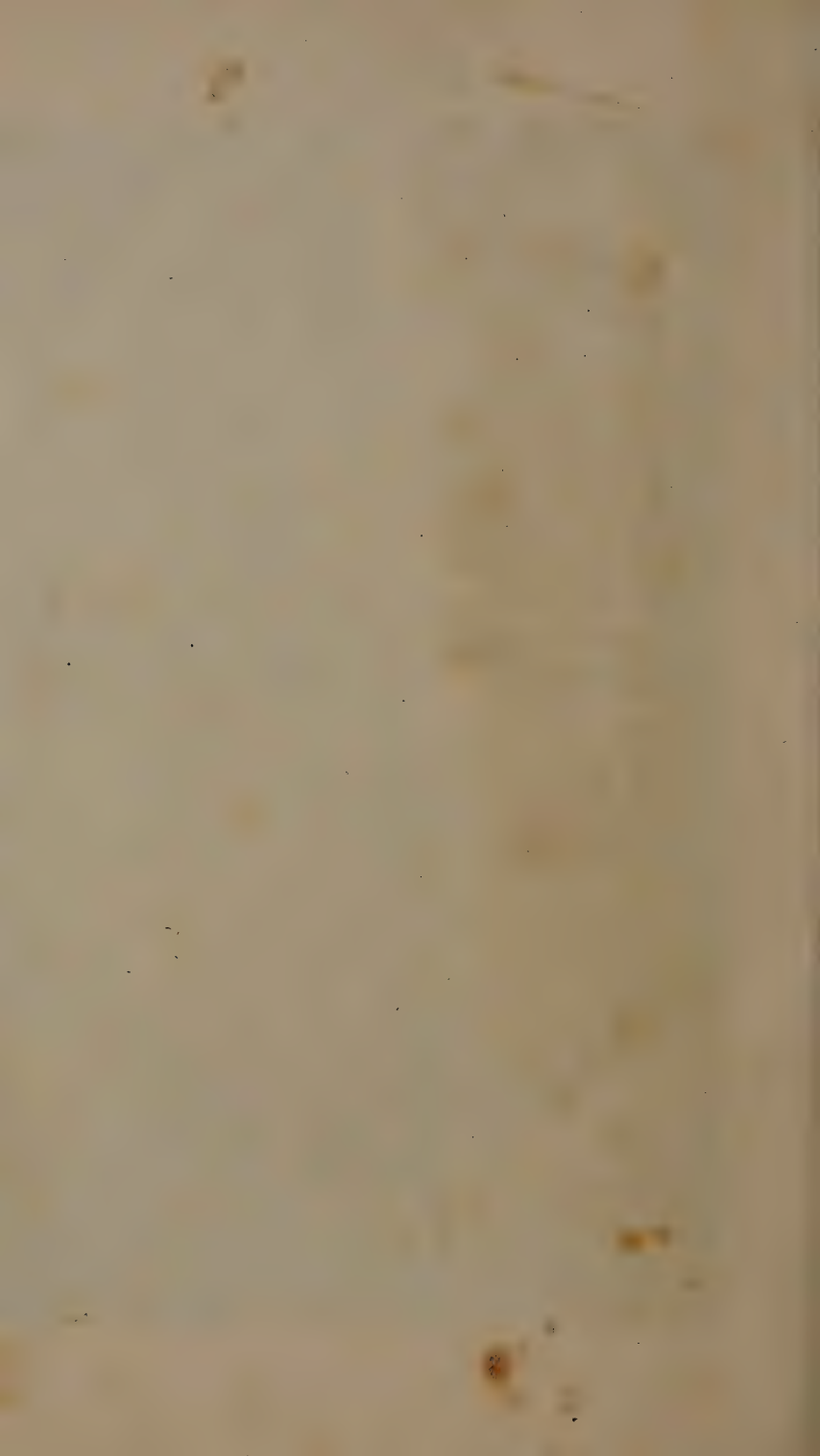






Designed by H. C. Lewis

Engraved by the Author.



I N D E X.

A

- Abendwolke or Fallcloud, 12, *note*.
 Action of clouds on each other, 89.
 Aërolites, 125.
 Alternating colours of Stars, 86, *note*.
 ANIMALS show signs of the weather, 130.
 by instinct and not by observation, *ibid*.
 Virgil's opinion of, *ibid*.
 Antares and other Red Stars, *ibid*.
 Ants, carrying about their eggs a sign of Rain, 137.
 Aratus quoted, 128 and *alibi*.
 Atmospheric changes not the cause of sudden cures, 176, *note*.
 Diseases and Epidemics, *ibid*.
 Superstitions and Antiquities, *ibid*.
 Electricity, 209.
 Aurora Borealis or Northern Lights, 218.
 at Hartfield, 219.

B

- Balloons indicate the succession of currents in the air, 202.
 Bells rung on All Soul's Day, 304.
 distant sound of, portends Rain, see Prognosticks.
 Bertholon, l'Abbé, his idea of the electrical office performed by Scud
 and other flying clouds, 48, *note*.

C

- Cats, atmospherical diseases among, 193.
 Changes of weather, 128.
 of colour in clouds, 88.
 Cirrocumulus or Sondercloud, 15.
 Cirrose Crown, 33.
 Cirrus or Curlcloud, 5.
 Cirrostratus or Wanecloud, 17.
 Clouds, M. Howard's theory of, 1.
 Aristotle's notion of their causes, 2.
 Nomenclature of, and their new English names, 5 and sequel.
 their colours, 84 and 88.
 their elevation at different times, 90.
 their structure and buoyancy, 95.
 Ideas of De Luc and Saussure of, 96.
 of the subdivisions of their modifications, 40 and sequel.
 Cock, figure of, used for Vanes on steeples, 265.
 Cockcrowing, superstitions concerning, 264.
 Colour of Starlight, 86, *note*.

Corona a luminous phaenomenon, 101.
varieties of, 102.

Corpse Candles, 316.

Cumulus or Stackencloud, 9.

Cumulostratus or Twaincloud, 20.

Curlicloud, plate i. fig. i. 5.

is of a netlike form at times, 6.

is linear, filiform, or comoid, *ibid.*

is always an electric conductor, 7.

the everchanging figure of, indicates unhealthy weather, and disturbed electricity, 8.

various remarks on, 41 *et alibi*.

Cymoid Cirrus, a stormy sign, 145.

D

Daycloud, a name of the Stackencloud or Cumulus, 9.

Dead Men's Candles, 316.

De Luc's idea of Meteors, 119.

Dew, 113, *note*.

E

Electrical Phaenomena various, 220 and sequel.

Electricity, 220.

anciently worshipped, 208.

of clouds, 209 and sequel.

embodied, 216.

Elm Tree, vapour on, 125.

Etymology of cloud, 1.

F

Fables, ancient, often meteorological, that of Phoebus and Pythen, 60.

Fallcloud, 12 and sequel.

causes Mists and Fogs of different sorts, *ibid.*

all Fogs are not of this modification, 13.

called Abendwolke or Nightcloud, 12, *note*.

Fetch Lights, 316.

Flora, Calendar of, *Supplement*.

Floras, the Six principal, 154.

G

Grele et Gresil, or Snow or Sleet, 86.

H

Halo, classification of the different sorts of, 98 and sequel.

different from a Corona, 101.

causes of, 105.

Helmo St. or St. Elmo's Fires, 313.

Homer and Hesiod, prognosticks from, 129.

I

Indications of fair weather, 151.

of Rain, 133.

from Virgil, 135 *et alibi*.

see Prognosticks.

Iodine for the cure of Goitres, *Calendar of Flora*, July 31, 1822.

K

- Kalendar, superstitions respecting particular days in, 272 and sequel.
of Flora Fauna and Pomona during 17 years, 353 and sequel.

L

- Lambe Dr. his opinion of animal food and water, 189.
Light, curious electric, about plants, 354.
Lightning, of two kinds, 215, *note*.
 silent, 216.
 Traps or Conductors, 217, *note*.
Lumen lambens circa plantas, 354.
Lunar and Solar Influence, 161.

M

- Man in the Moon explained, 269.
Meteors, description of, 114 and sequel.
 have long tails, *ibid*.
 prevail much in August, see *Calendar*.
Miraculous cures falsely ascribed to atmospherical changes, 176.
Moon, superstitions respecting, 267.
 ancient fable of the Man in, explained, 269.
 prognosticks from the, 150 *et alibi*.
 influence of, 161.

N

- Nautical Almanacks and Ephemerides, hint as to a certain useful appendage to, 185, *note*.
Nepheology or the Science of Clouds, 1.
Nimbus or Raincloud, 23.
Nyon, violent storm at, 72.

O

- Oxygen and Nitrogen in clouds, 96.
Owl reckoned ominous, 256.
 hoots before a change of weather, 138.

P

- Paraselene, 203.
Parhelion, 102.
Paroxysms of disorders dependent on the Moon, 249, *note*.
Paul's, St., Day, verses on, 278.
Plane Trees, 194.
Plants, ancient verses describing their flowering in honour of particular saints, 280.
 times of their flowering, *ubique* in the Calendar of Flora, &c.—
 being the Supplement to this work.
Primaverall Flora, what? 155. See Flora.
Prognosticks of the weather, 128 and sequel.
 of the seasons, 153 and sequel.
 of Rain from, animals, 130.
 from plants, 141.
 from the sky and clouds, 143.
 of fair weather, 151.

Proverbs concerning the weather, 165.
 relating to the seasons, 165.
 Pythagoras, his speech from Ovid, 320.

R

Rain, 23.
 Rainbow, 103.
 Raincloud, 23.
 Ravens croak differently before Rain and before fine weather, 138.

S

Saints' Days, 272 and sequel.
 St. Francis Xavier, 177, *note*.
 St. Winifred's Well, *ibid*.
 Saints Matthew, Mark, Luke, John, and Cyprian, *ibid*.
 St. Swithin, a rainy sign deduced from, 295.
 St. Paul, prognosticks from his Festival, 274.
 St. Elmo's Fires, 224.
 Shepherd of Banbury's Calendar, 171.
 Snow and Sleet, 86.
 Song to summer, 289.
 Stackencloud, 9.
 Stars, on the changing colour of, 86.
 Storms, very violent, occur simultaneously in distant places, 72.
 at Vevai in Switzerland, *ibid*.
 Storms, in France and Holland, *ibid*.
 at Bridgenorth in Shropshire, *ibid*.
 Swallows, early coming of, 160, *note*.

T

Thunderstorms, 71 *et alibi*.
 Tulip, a monstrous variety of, Calendar of Flora, &c. 437.

V

Vanes, the best form for, 204.
 why called Weathercocks, 265, *note*.
 curious one at Walthamstow, 203.
 Vapour, curious, on an Elm tree at Clapton, 125.
 Plane, 11 and 89.

W

Weathercock, see Vane.
 Will with a Wisp or Jack o' Lantern, 224.

THE END.

